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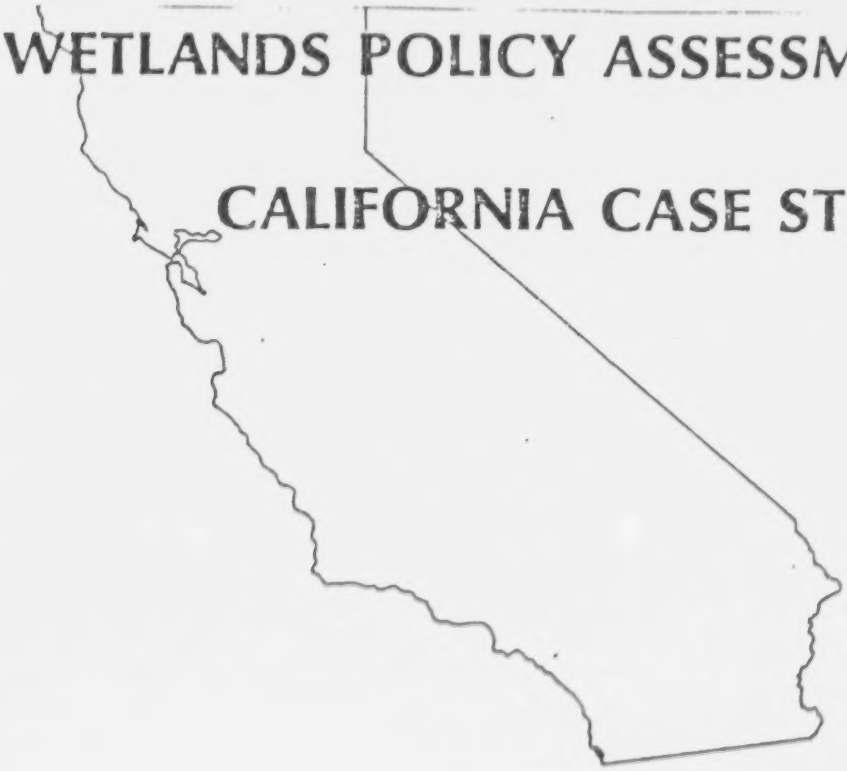
# WETLANDS POLICY ASSESSMENT

# CALIFORNIA CASE STUDY



Prepared for

Office of Technology Assessment
Washington, D.C.

September 7, 1982

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## EXECUTIVE SUMMARY

### INTRODUCTION TO THE STUDY

The Office of Technology Assessment (OTA) of the United States Congress undertook a comprehensive study of regional and national trends in the uses of wetlands, the impacts of these uses on wetland values, the feasibility of restoring or enhancing wetlands, and the effectiveness of present public regulatory programs and policies in the protection and management of wetlands. California is one of ten regions in the United States selected for assessment of past and present distribution of wetlands and the factors which have influenced their disposition.

OTA's report to Congress in 1983 will synthesize the results of the regional case studies and other components of OTA's assessment, providing Congress with background information for scheduled review of the Clean Water Act (CWA). The focus of the overall study is the CWA Section 404 regulatory program, exercised by EPA and the U.S. Army Corps of Engineers throughout the United States. This program has engendered controversy in California and elsewhere, in both procedure and substance; beyond that, questions have been raised as to the appropriateness of its mission as a wetlands protection program.

### HISTORY OF LOSSES

The case study of California traces the history of wetland losses in six geographic subregions: Klamath Lakes Basin and Modoc Plateau in northern California and southern Oregon; the North and Central Coast, extending from the Oregon border to Point Conception; San Francisco Bay; the Central Valley; the South Coast, from Point Conception to the Mexican border; and the Desert, encompassing the Mojave and Colorado desert areas from Mono County to the Colorado River.

These geographic subregions of California contain a variety of wetlands, reflecting the wide range of physiographic and hydrologic

conditions that can occur within a basically Mediterranean climate (dry summers, wet winters).

The most significant and largest wetland areas that remain in California are in the Klamath Basin, Humboldt Bay, San Francisco Bay, Suisun Marsh, and the Central Valley. The Pacific Coast holds a string of many minor wetlands within river mouths and estuaries and a few major wetlands (1,000 acres) such as Elkhorn Slough and Tijuana Estuary. The Central Valley, historically the largest container of freshwater and brackish marshes now has scattered tracts of managed wetlands in both public and private ownership. In addition, seasonally flooded agricultural lands, constitute a secondary wetland habitat for waterfowl in the Valley as well as northern San Francisco and Humboldt Bays. Likewise, the Klamath Basin holds managed wetlands and agricultural lands ringing the many lakes in this region and owned by state, federal, and private entities. Many small oasis-like washes and riparian woodlands dot the desert region distinguished by their natural rarity rather than size. The Salton Sea and Colorado River offer the largest desert wetlands and riparian forests. San Francisco Bay, the state's largest estuary, has much of the remaining tidal and brackish marshland as well as large areas of potentially restorable diked historic wetlands.

The wetlands of California have several unique features and values. Coastal tidelands and estuaries provide the essential environment for oyster mariculture, reproduction and maturing of many fish species, as well as feeding thousands of migratory shorebirds and waterfowl. Eelgrass beds occur in particular estuaries on the Mendocino and Humboldt coastline and several other locations. The black brant grazes on this aquatic plant during its migration, and these beds are nursery areas for developing crab, fish, and invertebrate larvae. Riparian forests throughout the state support the greatest variety of wildlife species compared to other habitat types. The growing public interest in California wetlands is evident in trends towards public preservation and recreation in coastal and San Francisco Bay wetlands, as well as

scientific research in these areas. Waterfowl hunting groups continue to be the most effective lobby for wetlands preservation in the Central Valley and Klamath areas. In addition, diked wetlands act as both seasonal wetlands and retention basins for stormwater runoff.

Table *i* summarizes wetland losses in California since 1850 and outlines current trends in uses of wetlands. The history and distribution of wetland losses in California correspond to the history and settlement patterns in the state. Major conversion of swamplands to productive agriculture in the 19th and early 20th centuries accounts for the largest loss of wetlands statewide. The Central Valley and Sacramento-San Joaquin Delta, which once held 4,000,000 acres of wetlands, became the bread basket of the west, but at the expense of 96% of the valley's native wetlands. Agricultural development has prompted a 60% conversion of wetlands in the Klamath Basin as well. Reclamation there was promoted largely by federal water projects. Some marshes also have been converted to agricultural use along the coast and in San Francisco Bay, particularly in alluvial and tidal floodplains, where fertile soil is a product of a past flooding regime.

Flood control and water development projects account for major losses of wetlands, particularly in the Central Valley but throughout the state as well. The necessary association of wetlands and riparian areas with episodic inundation dictates that these habitats will be lost as floods are controlled or water is diverted. Maintenance of wetlands in the Central Valley now entails competition for scarce and costly water. Control of Colorado River flood flows eliminated much of its adjacent riparian areas; a similar condition accompanied flood control in Los Angeles and Orange Counties.

Port and harbor development in Los Angeles, Orange County, and San Diego accounted for direct dredging and filling of many large estuaries. Urban developments in coastal watersheds and wetlands, beginning in the 1920s and 1930s and accelerating following World War II, have indirectly silted in and filled many wetlands. The record of diking and/or filling of portions of each southern California

TABLE *i*

CALIFORNIA WETLANDS

SUMMARY OF HISTORIC LOSSES & CURRENT TRENDS

| Region | Estimate of Original Acreage and Percent Reduction | Approximate Remaining Acreage | Protected Acreage of Wetland (Where known) | Current Trends |
|---|---|---|---|---|
| California (excluding Klamath Lakes Basin in Oregon) | - 5 million | 450,000 | 175,192+ | See regions |
| Klamath Lakes Basin | - 189,000<br>- 60% | unknown | 151,375 total<br>81,049 wetland | - agricultural reclamation of private and managed wetlands |
| Modoc Plateau | unknown (acreage has increased in certain areas) | 32,240 private<br>40,000+ public addition unspecified acreage | 40,000+ | - creation of wetlands in Modoc National Forest<br>- some conversion to agricultural uses |
| North & Central Coast | unknown | unknown | 8,540+ wetlands & tidelands | - sedimentation of wetlands due to logging & agricultural practices in adjacent watershed<br>- agricultural reclamation<br>- preservation as parks & recreation areas |

TABLE *i* (Continued)

| Region | Estimate of Original Acreage and Percent Reduction | Approximate Remaining Acreage | Protected Acreage of Wetland (Where known) | Current Trends |
|---|---|---|---|---|
| San Francisco Bay | 313 sq. miles wetlands<br>- 75% loss of original<br>- 60% loss when wetlands newly created from sedimentation are considered | 59 sq. miles of original wetlands<br>- 125 sq. miles total<br>- 52,000 acres diked wetlands<br>- private managed wetlands | 43,750+ | - pressure for filling of diked historic wetlands for urban uses to accommodate large population increases<br>- some losses to port and harbor development<br>- salinity increases in Suisun Marsh due to water diversions<br>- preservation as refuges and parks |
| Central Valley | - 4 million<br>- 94% | 81,184 public<br>292,400 private | 81,184 total<br>39,200 flooded | - Conversion of private wetlands to agriculture<br>- Conversion of secondary wetlands habitat (ricelands) to less water-intensive crops<br>- Reduction of flooded public acreage due to rising pumping costs and decreased availability of water<br>- Degradation of habitat value on secondary wetland areas due to technological advances in farming practices<br>- preservation as NWRs[1/] and WMAs[2/] |

[1/] National Wildlife Refuges

[2/] State Wildlife Management Areas

TABLE i (Continued)

| Region | Estimate of Original Acreage and Percent Reduction | Approximate Remaining Acreage | Protected Acreage of Wetland (Where known) | Current Trends |
|---|---|---|---|---|
| South Coast | - 53,000 acres<br>- 75% | 13,000 | 5,560 | - extreme pressure to develop for urban uses, recreational marinas and port expansion as developable land area in South Coast is decreasing and population continues to grow |
| Desert | unknown | unknown | unknown | - limited preservation as parks and wildlife refuges<br>- disturbance and removal of riparian vegetation from surface mining<br>- feral burro trampling and grazing of riparian vegetation and desert springs<br>- inundation and dredging of riparian and wetland areas along Colorado River and Salton Sea |

estuary, lagoon, or rivermouth is quite complete; approximately 10% of former tidal wetlands remain in Los Angeles and Orange Counties, referred to now as "museum pieces" by one observer. San Francisco Bay Area tidal marshes and the bay surface have also been filled to accommodate urban expansion and industrial development. Of the historic marshes, 25% remain. Diked former baylands, many of them in agricultural use, provide a secondary habitat to water associated birds in the San Francisco region. The north and central coast has been least impacted by dredging and filling of wetlands. Urban pressures are minimal; however, early agricultural conversions and silvicultural practices removed large areas from tidal influence and/or caused massive siltation into estuaries and lagoons. Government programs on the Modoc Plateau are acting to increase wetland acreages.

The evidence is overwhelming that the majority of the state's historic wetlands no longer exist and that there are continuing pressures on the approximate 9% that remain. While the percentage losses vary from region to region, statewide, the native 5,000,000 acres have been reduced to less than 500,000, with a corresponding percentage reduction in the wildlife populations that depend on them. Changes in wildlife species and numbers with loss of wetlands is documented in many specific cases. Certain resident species have been entirely eliminated from areas, such as tule elk; others are diminished in numbers. Eighteen animal species are listed as rare, endangered or threatened, largely because their continued survival depends on wetland habitats. Several plant species are listed as endangered for the same reason. The reduction of waterfowl numbers through loss of habitat is best known of all wildlife losses in California wetlands. For example, peak seasonal concentrations of waterfowl in the Klamath Basin have fallen from 6 million to 1 million, nearly 80% of waterfowl presently using the Pacific Flyway. Sixty percent of these waterfowl over-winter in the Central Valley. /134/ It has been determined that wintering habitat in California, rather than breeding habitat, has become most limiting to waterfowl populations. /137/

REGULATION OF WETLANDS

The federal government is involved in wetlands through direct or delegated permit authority, memoranda of agreement, which call for comment on federal actions, review of federally aided state and local actions, and management of federal lands in California. Several laws and directives have an overriding influence on federal actions. The National Environmental Policy Act (NEPA) provides the basic environmental charter and supports many more specific directives. Executive Order 11990: Protection of Wetlands is particularly important in comment on the consistency of federal actions and in management of federal lands. It is the only broad federal directive that is specific to wetlands outside the regulatory programs of the Corps and EPA. It is less important in the Corps construction programs. E.O. 11988: Floodplain Management is of secondary importance in its proscription against encroachment into floodplains (and wetlands, where present in floodplains). The Endangered Species Act has prompted the Corps and other agencies to assert jurisdiction in isolated or marginal wetlands containing endangered wetland species. This act also reinforces special management of wetlands on federal lands.

The principal federal agency regulating the use of wetlands in California is the Corps of Engineers through Section 10 and/or Section 404. The scope of Section 10 jurisdiction is important in California and is exercised separately from Section 404 in all three districts. Only in San Francisco Bay is Section 10 consistently asserted in diked lands, when historic navigability can be demonstrated. In these instances, the absence of wetland indicators restricts the review criteria to "public interest" and to Corps' general wetland policy. Section 404's lateral jurisdiction into adjacent wetlands, the definition and scope of polluting activities, and geographic scope of jurisdiction into stream head waters and isolated wetlands, have caused the greatest controversy in the three California Corps Districts, San Francisco, Sacramento, and Los Angeles.

Both U.S. Fish and Wildlife Service and the State Resources Agency, under the Fish and Wildlife Coordination Act, take an active interest in the implementation of the program and contribute heavily to its effectiveness in California. While most permit decisions are resolved at the District level, the lack of water dependency of a project, as a criterion for permit approval, has prompted the most elevations of Corps permit decisions by U.S. Fish and Wildlife Service. This active involvement of the wildlife agencies is generally viewed with dismay by landowners and permit applicants, who regard mitigation requirements as excessive at best.

The wetland protection policies of the Coastal Zone Management Program is evidenced largely through the California Coastal Plan and California Coastal Commission (CCC). The CCC also seeks consistency of federal actions with its provisions wherever practicable, and consistency of 404 permit actions with the state's coastal zone management program. These two provisions cover the entire 1,100-mile coastline, extending into some upland areas, and the intertidal portions of San Francisco Bay and Humboldt Bay.

Protection of wetlands by the State of California is guided by two main directives: the California Environmental Quality Act (CEQA), which, like NEPA, establishes the basic protection charter of the state, and the state's Basic Wetland Protection Policy, 1977. The policy lacks statutory authority and judicial test, but is applied by other state agencies within their own project review. The policy does not clearly define wetlands or authority to regulate them, nor does it set standards for mitigation.

The three state statutes with direct permit authority are the Coastal Act, and its regulatory provisions for sensitive wetlands and other wet habitats in the Coastal Zone; the Suisun Marsh Protection Act, which covers a largely managed portion of the state's wetland resource; and the McAteer-Petris Act which enables San Francisco Bay Conservation and Development Commission (BCDC) to regulate bay fill up

to the "line of highest tidal action." Humboldt Bay is protected by similar authority. The San Francisco Corps District, in exercising jurisdiction in diked historic wetlands, thus has broader authority over many thousands of acres of modified wetlands than BCDC. The Coastal Commission is of greater regulatory import than the Corps along the coast.

The exercise of the state's public trust easement in diked and undiked lands is significant where historic tidal action can be verified. The state's interest must be demonstrated on a case-by-case basis, however, so is unpredictable in outcome.

The Department of Fish and Game (DFG) is the principal agency in California charged with protection of wildlife habitat. Under the Fish and Game Code, the department can regulate duck hunting and fishing and enter into agreements regarding alteration of streambeds. Otherwise the DFG is restricted in direct authority. DFG's comments on 404 actions expressed through the Resources Agency, however, weigh heavily in Corps decisions. Although the DFG is not always popular with 404 applicants, they have attempted in a variety of ways to protect and restore California wetlands through acquisition, dedication, and mitigation requirements.

The state's Porter-Cologne Water Quality Control Act, which established the State Water Resources Control Board and Regional Water Quality Control Board, is empowered to protect water quality objectives in the state. The boards administer the National Pollution Discharge Elimination System (NPDES) program under Section 404 of the Clean Water Act.

The State of California has only three statutes that protect regional wetlands on the coast, in the San Francisco Bay Area, and in Suisun Marsh. The state has expressed a public concern for wetlands in a number of ways, but the instruments to carry out policy are limited. The state has come to rely on the federal presence, assuming that the basic charge and authority for wetland protection would be federally directed and secondarily reinforced by state policy. At present, the state is reluctant to

assume delegation of the Section 404 program, even though several statutory or administrative mechanisms could be tailored to do so.

Local governments are responsible for implementing CEQA and state planning law, both of which in indirect ways provide for protection of sensitive habitats, including wetlands. While most California cities have adopted policies in open space and conservation elements of their general plans, few have adopted ordinances to carry out the policies in their own wetland areas.

NON REGULATORY FORMS OF PROTECTION

The federal government began acquiring and managing wetlands for waterfowl in Califronia in the early 20th century, at the same time that federally sponsored reclamation was actively draining other wet areas for cultivation. National Wildlife Refuges are now concentrated in the Klamath Basin, the Central Valley, Humboldt Bay, San Francisco Bay, certain coastal wetlands, Salton Sea, and the Colorado River. The state began acquiring wetlands as wildlife management areas (for regulated hunting and fishing) and ecological reserves in the 1940s, accelerating these programs in the 1970s. Two national estuarine sanctuaries have been established on the coast. The Califronia Coastal Conservancy administers state and federal grants for restoration of various coastal resources including wetlands through public-private financing techniques.

Private initiatives and investment in wetland protection have been lead by duck clubs and waterfowl interests. The managed wetlands of Suisun Marsh, which account for 10% of the California resource, are protected largely because of the political influence of hunting clubs. Most of the remaining wetlands in the Central Valley are either private duck clubs or wildlife refuges managed largely for waterfowl. Incentive programs for wetlands in private ownership have encouraged but not fully compensated the costs. Nature Conservancy and Trust for Public Lands are the major privately financed organizations that have managed to broker the acquisition of wetlands by purchasing and holding wetlands until public funds

were available. Nature Conservancy continues to hold and manage some areas of wetlands.

Conservation organizations take a general interest in wetlands in the state. Their strength is greatest in the San Francisco Bay area, diminishing to the east and south, where grass-roots conservation support is localized. In the south, specific Wetlands arouse local constituencies, injecting into the federal and state regulatory process an intense public interest element. This is counteracted in part by coalitions of development interests and, especially, coastal landowners who are able to fund anti-wetland or anti-regulatory lobbies. These latter interests have not been particularly successful in subverting the coastal regulatory programs themselves.

EFFECTIVENESS OF PROTECTIVE REGULATION

The public agency network that sets policy and/or regulates wetlands in California is effective in varying degree in responding to regional and local wetland issues. Effectiveness must be viewed from the standpoint of both the regulated (landowners, permit applicants) and the resource. With regard to the former, effectiveness can be measured in terms of regulatory leniency, predictability, expediency, responsiveness to schedule demands, objectivity, and other characteristics which reflect the persuasion and priorities of the applicant. The case study cites examples of both cooperative and uncooperative attitudes.

The informal evidence revealed that, in general, applicants view most regulatory processes as obstacles and fail to distinguish the specific requirements of one from those of another in evaluating their effectiveness, especially when state and federal processes commingle. In California only two areas demonstrate substantial overlap: the San Francisco Bay and the California coast. In both areas, the specific requirements of the Corps program are obscured by the larger state-federal-local regulatory structure.

Effectiveness, viewed in terms of protection of the resource, stems from two basic factors: the inherent authority and jurisdictional limitations of the programs dealing with regional wetlands issues; and the operation of the 404 program by each Corps District. Table *ii* summarizes the regional wetland issues and the degree of regulatory authority each receives. Along the coast, three processes are largely unregulated by federal or state agencies: erosion in coastal watershed and associated sedimentation of downstream wetlands, the removal of riparian vegetation along intermittent (above headwaters) streams, and filling of isolated wetlands. In the Central Valley, no regulatory system governs the conversion of managed wetlands to agricultural lands and other uses. These issues are beyond the scope of the 404 program and not actively regulated by other state and local jurisdictions.

The operation of the Corps program varies among Districts, subject to two closely related factors: the attitude taken by the District Engineer and personnel administering the program; and the nature and degree of public support and attitude, including that of the applicant, toward regulation of the resource. In the San Francisco District, conservation and environmental concerns are a high priority of the residents, In contrast, the Los Angeles District's region lacks a broad conservationist constituency. The Sacramento District has no jurisdiction over those wetlands of primary interest to conservationists - managed duck clubs.

Enforcement of the Corps regulations is a problem in all three districts but is the primary impediment to effective operation of the Los Angeles District. Lack of fining power and respect for the law by violators, and insufficient staff for surveillance and follow up account for the Los Angeles District enforcement problem.

CONCLUSIONS

In summary, the Corps Section 404/10 program, despite certain inadequacies, represents the strongest regulatory authority statewide for protection of remaining wetland and riparian areas. State programs (BCDC,

TABLE *ii*

CALIFORNIA WETLAND ISSUES AND THEIR REGULATION

| Wetland Issue | Specific Region Affected | Regulatory or Statutory Authority |
|---|---|---|
| **San Francisco District** | | |
| Filling of diked wetlands for urban uses | San Francisco Bay, Humboldt Bay and certain coastal estuaries | Corps (limited)<br>Local governments (infrequent) |
| Filling, dredging of tidal wetlands for urban uses, ports and harbors | San Francisco Bay, primarily North and Central Coast | Corps<br>Coastal Commission<br>BCDC<br>Humboldt Bay Harbor Recreation and Conservation District |
| Agricultural conversion of wetlands | Klamath Basin<br>North Coast | Corps (limited) |
| Sedimentation of wetlands from watershed disturbances, including logging, agriculture, and urban development | North & Central Coasts<br>San Francisco Bay | California State Board of Forestry (limited)<br>Regional Water Quality Control Board (very limited)<br>Local governments through grading ordinances (few in effect) |
| Salinity increases in wetlands due to upstream water diversion | San Francisco Bay-Suisun Marsh<br>Central Valley-Delta | State Water Resources Control Board<br>Regional Water Quality Control Bd.<br>State Department of Water Resources<br>Bureau of Reclamation |
| Covering of wetlands with materials other than "fill" intended for development (i.e., sanitary landfills, logging slash) | San Francisco Bay<br>North Coast | Environmental Protection Agency or Corps - authority unclear<br>Regional Water Quality Control Bd. |

TABLE *ii* (Continued)

| Wetland Issue | Specific Region Affected | Regulatory or Statutory Authority |
|---|---|---|
| **Sacramento District** | | |
| Filling of private, managed wetlands for agriculture or other uses | Central Valley | ----- |
| Filling of private, unmanaged wetlands for agriculture or other uses | Central Valley | Corps (limited; applies only if considered adjacent wetland) |
| Removal of riparian vegetation for levee maintenance, bank stabilization | Sacramento-San Joaquin Delta and Sacramento and San Joaquin Rivers | Corps<br>Bureau of Reclamation |
| **Los Angeles District** | | |
| Filling of riparian areas above stream headwaters and isolated wetlands covered under nationwide permits | South Coast | Corps may require an individual permit if water quality, endangered species or cultural resources are a concern at a site; local governments |
| Filling/dredging of wetlands for urban and port development | South Coast | Corps<br>Coastal Commission<br>Local governments |
| Sedimentation of wetlands from urban development in watershed | South Coast | Regional Water Quality Control Board (very limited)<br>Local governments through grading ordinances (few in effect) |
| Removal of riparian forest for desert mining activities and from feral burro grazing | Mojave Desert | Bureau of Land Management |

TABLE *ii* (Continued)

| Wetland | Specific Region Affected | Regulatory or Statutory Authority |
|---|---|---|
| Removal of riparian vegetation for levee maintenance, bank stabilization | Colorado River | Bureau of Reclamation<br>Corps |
| Inundation of wetlands and possible disruption from geothermal drilling | Salton Sea | Bureau of Land Management<br>Corps<br>Local Government |

Coastal Commission, Regional Water Quality Control Boards), while of geographical or functional importance, are limited either in territory or application of authority. Private-public initiatives offer a partial solution to balancing regulation with use of the wetland resources in California. It seems safe to predict that, in the absence of the conspicuous federal regulatory structure, reinforced by the state, the wetland resource will continue to dwindle, acre by acre.

# INTRODUCTION

## BACKGROUND

The Office of Technology Assessment (OTA) was requested by the U.S. Senate Environment and Public Works Committee to conduct an assessment of Section 404 of the Clean Water Act (Federal Water Pollution Control Act, Amended 1972 and 1977) and the Section 404 regulatory program in connection with scheduled reauthorization of the act. Section 404 permit program regulates the discharge of dredged and fill material into waters of the United States (33 U.S.C. 1344). In California, the program is administered by the U.S. Army Corps of Engineers, represented by the San Francisco, Sacramento, and Los Angeles districts. The program is subject to EPA guidelines and the oversight role of Region IX.

OTA developed a series of tasks to provide a framework for analyzing trends in the changing distribution, extent, and use of wetlands in various regions of the country, the impacts of developed use on wetland functions, and the feasibility of mitigating or "conditioning" future use and restoring wetlands where possible. OTA defined ten regions in the United States which represent classes of wetlands and demonstrate differences in wetland conditions, in the exercise of federal regulatory authority, and in the relative effectiveness of institutional interactions at federal, state, regional, and local levels of government with respect to protection of wetlands. California is one of these regions. The case study which follows assesses the past and current effects, both problems and benefits, of applying the Section 404 permit program in California wetlands. In a broader sense, the case study examines the statewide wetland resource, its history characterized primarily by losses, and the nature of its protection and future disposition to the extent that predictions can be derived from the recent history of laws, policies, and programs which directly or indirectly influence the governance of wetlands in the state.

The loss of wetlands and their protection in California have been the subject of extensive study, debate, and controversy since the

mid 1960s, when public recognition of losses in certain areas, notably San Francisco, began to be translated into political action, both for and against wetland protection. Since that time, interest in wetlands and corresponding documentation of cases and controversy have grown exponentially in California (as elsewhere). One objective of the California regional case study has been to select the most typical and useful data and examples from published and unpublished literature and from many informed persons, such that a series of useful profiles would emerge, characterizing wetland trends in the state as a whole as well as in geographic subregions within the state.

A second objective has been to select from the abundant body of information the institutional conditions, influencing laws and policies, and which best illustrate and expose to examination the intent, substance, procedures, and effectiveness of the Section 404 program and related federal, state, and local programs. Every effort was made to adhere strictly to these two study objectives.

## APPROACH

### WORKING ASSUMPTIONS

Three issues are central to the assessment of wetland policy in any geographic region. They surface repeatedly in the California case study, and each could be examined in detail, exceeding the scope and purpose of the present study. In order to deal with them and still proceed efficiently, we established three working assumptions:

1. It is a desirable national goal and a demonstrated California goal to maintain, protect, and where possible, enhance/restore wetlands. Numerous legislated acts, policies, and regulatory programs at national and California state levels support or reinforce this goal. The institutional mechanisms for accomplishing this goal are at issue, as are the questions of "balanced use" and the appropriate level at which the goal

should be pursued, i.e., whether at the national, state, or local level.

2. A number of benefits, or values, are ascribed to wetlands and outlined in the Section 404 regulations. These have taken on the permanence and certitude of environmental dogma, even though the evidence for these values is frequently derived from research in many types and locations of wetlands in the United States and extrapolated to other wetlands, whether applicable or not. Notwithstanding the incongruities between empirical and assumed values, there are certain benefits (fish and wildlife habitat, biological productivity, groundwater recharge, scientific and educational use, socioeconomic [e.g., flood protection, storm buffer], and protection of water quality) one or more of which are demonstrated by all wetlands in California, regardless of type, size, or location. The most consistently acknowledged value of California wetlands is wildlife habitat use, especially by migratory waterfowl and winter resident water-associated birds. This use is well-documented in many locations.

   At the risk of begging a question which is frequently raised by applicants for entitlements in California wetlands, this assessment does not scrutinize these assumed values. At some point in the regulation/protection of wetlands, relative values and specific habitat utilization (as by certain species) must be more rigorously documented to provide a defensible basis for protecting wetlands on both regional and case-by-case levels. Numerous cases in California exemplify the need for more careful estimation of wetland value, especially as it provides the base for regional resource planning and determining specific mitigation and compensation measures.

3. Finally, in assessing California wetland policy, we generally use the 404(b) regulatory definition of wetlands. This defines

the Corps' jurisdiction under the Clean Water Act (33 CFR 323.2[c]). Other statutory and regulatory definitions are compared, such as that applied in the California Coastal Act. (Table 1)

Nonregulatory definitions (e.g., U.S. Fish and Wildlife Service; E.O. 11990) are also referenced, as are "nonwetlands" which have important wetland attributes. These include riparian areas in various parts of California and seasonally flooded diked agricultural lands in the Sacramento-San Joaquin Delta which substitute in part for ancestral waterfowl habitat but are not consistently classified as wetland. Vernal pools and other isolated wetlands are also important wetland types in California, only occasionally falling within Corps jurisdiction.

Definitions vary with "experts" as well as with commenting agencies. For example, diked formerly tidal agricultural lands in Humboldt Bay are pumped, drained, and cultivated regularly. The soils are not clearly mapped as "hydric"; and the Corps has mapped but not claimed them within its jurisdiction./118/ Allowed to pond in winter, however, they become seasonal wetlands, supporting wetland vegetation (but not prime indicator species) and are heavily used by water-associated birds. A consistent legal definition of wetland may be critical to effective and fair exercise of 404 jurisdiction, but broad interpretations are necessary for a comprehensive understanding and protective policy for the resource as a whole.

## STUDY FRAMEWORK

The assessment of issues, trends, and regulatory problems and benefits in California wetlands falls into three frameworks: *temporal*, *geographic*, and *functional* (or typical). Each of these provides a distinct but related dimension.

TABLE 1

WETLAND DEFINITIONS*

President Carter's E.O. 11990 (May 24, 1977) defines wetlands as follows: "The term wetlands means those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances do or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds."(emphasis added)

The joint Corps-EPA 404(b) permit regulations (July 19, 1977) define wetlands as follows: "The term wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." (emphasis added)

The Fish and Wildlife Service's wetland classification system (December, 1979) defines wetlands as follows: "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year."

The California Coastal Act (1976) defines wetlands as follows: "Land which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens." (Sec. 30121) Definition is broad in scope; the Act declares that it shall be liberally construed...to accomplish objectives (Sec. 30009). The Commission relies on the presence of hydrophytes and/or the presence of hydric soils.

The Keene-Nejedly California Wetlands Preservation Act (1976) defines wetlands as follows: "'Wetlands' means streams, channels, lakes, reservoirs, bays, estuaries, lagoons, marshes, and the lands underlying and adjoining such waters, whether permanently or intermittently submerged, to the extent that such waters and lands support and contain significant fish, wildlife, recreational, aesthetic, or scientific resources."(Sec. 5812[a])

*Note: No court has specifically considered the sufficiency of a particular analytic technique or delineation methodology for determining wetland status. Courts generally defer to expert agencies or scientists on technical matters and will likely not disturb a selected methodology.

TABLE 1 (continued)

Traditional navigability (also called "Section 10 jurisdiction"): Navigable waters subject to federal authority, defined over a period of 80 years as those which are used or susceptible of being used in their ordinary condition as highways for commerce... A waterway once navigable in interstate retains its identification as navigable regardless of modifications...or if reasonable improvements can make a waterway suitable for navigation in interstate commerce..; subject to the ebb and flow of the tide, to the mean high tide line in tidal waters (formerly MHHW on Pacific Coast) and ordinary high water mark in nontidal rivers and lakes. Outside the high water mark, jurisdiction is extended only if projects would affect the course, location, or capacity of navigable waterway.

Waters of the United States (also called "Section 404 jurisdiction") defined in the Corps' 1980 proposed regulations, waters of the U.S. include

(1) All waters, including their adjacent wetlands, that are part of a surface tributary system to and including navigable waters of the United States (man-made, nontidal drainage and irrigation ditches excavated on dry land are not considered waters of the U.S. under this definition);

(2) Interstate waters and their tributaries, including adjacent wetlands; and

(3) All other waters of the United States not identified in paragraphs (1) - (2) above, such as isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not part of a tributary system to interstate waters or to navigable waters of the United States, if in the opinion of the Division Engineer the degradation or destruction of such waters could affect interstate commerce.

The landward limit of jurisdiction in tidal waters, in the absence of adjacent wetlands, shall be the high tide line and the landward limit of jurisdiction in all other waters in the absence of adjacent wetlands shall be the ordinary high water mark.

TEMPORAL (HISTORIC) FRAMEWORK

The first, or "native," condition coincides roughly with the 1849 Gold Rush. Reclamation of the Sacramento-San Joaquin Delta began shortly thereafter and continued over the next 80 years. Urban concentations also began in San Francisco and southern California, encroaching on shoreline and tidal flats.

The second, or recent, time frame encompasses the 1920s through 1960s. It was a period of rapid urban industrial development in the metropolitan regions of California, notably Los Angeles, Orange County, San Diego coast, and San Francisco Bay. The third period—the decade of the 1970s—developed out of a groundswell of environmental concern. This period coincides with the enactment or amendment of a body of federal environmental laws and regulations, including establishment in 1968 of Section 10 public interest review. In California, the BCDC San Francisco Bay Plan, the California Coastal Plan, California Environmental Quality Act, and legislative actions and policies directly and indirectly concerning wetland protection in the state all began taking effect early in that decade.

The present decade of the 1980s, characterized by a political and economic climate that already is influencing Corps permit review, constitutes a fourth and final period in this chronology. It is a period in process, without a clearly defined end point or result.

GEOGRAPHIC FRAMEWORK

California is an overall "region" to the extent that remaining wetlands constitute a statewide resource; distribution, concentrations, and movements of waterfowl populations are dependent on the statewide distribution and capacity of available wetlands. Thus, the geographic framework for the regional case study is the state. The information base is necessarily general and the figures only approximate, but a useful picture of the diverse conditions and pressures on wetlands can be drawn for the state as a whole.

This is also the appropriate scale for presenting an overview of federal laws, policies, and programs dealing with wetlands, and comparing them with their state counterparts. Both federal and state programs, however, take on a highly subregional aspect in California, in practice, emphasis, and funding.

We have divided the state into geographic units, or subregions, representing general physiographic differences, and into the jurisdictional territories of the three California districts of the Corps (Figure 1). Each physiographic region contains particular types of wetlands that are important components of the overall resource, and each reveals different physical conditions and uses, development and economic pressures, social attitudes, and institutional responses. Overlaid on these regions are the substantially different problems faced by the three Corps district regulatory and environmental branches and their administrative responses to these problems. Figure 1 illustrates the boundaries of each subregion and Corps district.

The Central Valley region, for example, includes the largest acreage of wetlands in the state; most of it is in private ownership. Agriculture is the prevailing land use and is subject to rising taxes, energy costs, competing demands for water, and attractive markets of urban development. The pressure to convert native marsh to cultivated crops is chronic and the Corps has little leverage.

In contrast, the 404 program in San Francisco Bay has been the single most powerful tool by which remaining diked wetlands have been protected since 1968. On the southern coast, the California Coastal Commission took over the principal role in regulating coastal wetlands with the passage of Proposition 20 in 1972 and subsequent Coastal Act in 1976.

## FUNCTIONAL (TYPICAL) FRAMEWORK

The conditions and problems which characterize each geographic region can best be illustrated by typical and exceptional cases. Three

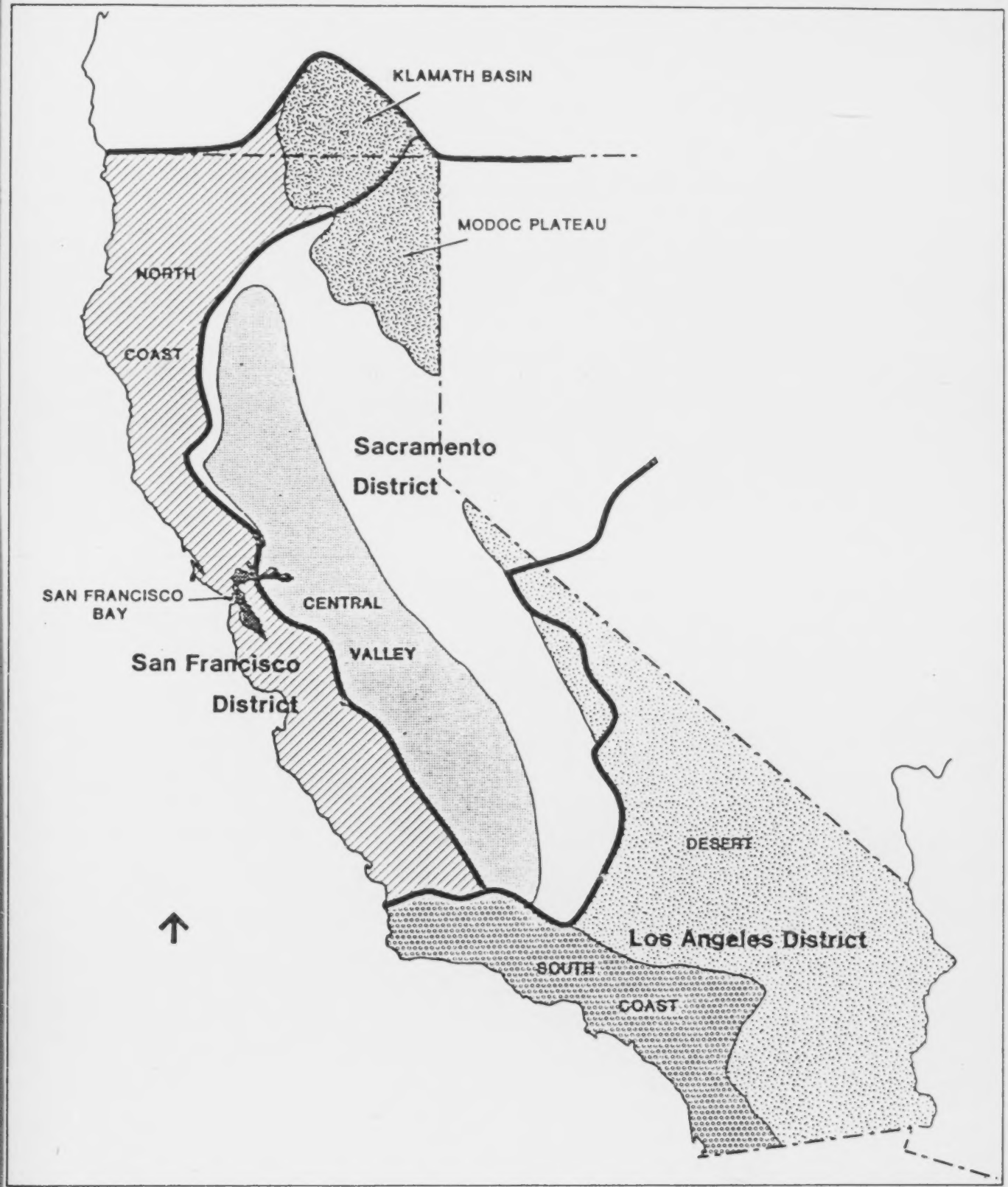



**FIGURE 1**

**Study Regions and Group Districts**

ESA/MADRONE

or four cases in each Corps district are presented in the study to illustrate particular facets of Section 404 or comparable state programs which bear examination.

The cases also serve to distinguish Section 404 and its effects from the network of laws and programs with which it coexists. For example, Section 9 and 10 of the Rivers and Harbors Act gave the Army authority to control a wide variety of activities affecting wetlands through application of the "Commerce Clause" and public interest review. The permit program is generally identical to 404 in process. Section 404 reveals broader jurisdiction scope (including lands adjacent to navigable waters) but regulates a more limited range of activities than Section 9 and 10. Both Section 10 and Section 404 demonstrate interdependence with numerous related laws which must be examined in that light. The modification of any one of these would have a dramatic ripple effect through an entire body of wetland or resource-related environmental laws and regulations.

INFORMATION SOURCES

The wide and discontinuous distribution of wetlands in the state has led to a similar disarray of information on their attributes and history. No single study comprehensively addresses the state wetland resources.

Certain bays and particular wetlands are well-studied and the changes in their shorelines and land use is documented. San Francisco and San Diego Bays are examples. However, while the tidelands and marshes of San Francisco Bay are well-documented, the original riparian resources are not. This data gap holds true for most coastal river and estuarine systems.

The California Department of Fish and Game completed 21 studies specific to certain coastal wetlands. Although well-researched studies, they do not cover all the coastal marshes and lagoons.

Certain agencies such as the California Coastal Commission and Coastal Conservancy and university researchers have prepared inventories and papers on certain aspects of many coastal wetlands. The information base for coastal areas is diffuse but relatively complete. A single overview document of coastal wetlands is sorely needed.

The waterfowl habitat of the Central Valley is given a thorough examination in the U.S. Fish and Wildlife Service Concept Plan. However, no comprehensive review of wetland or riparian resources of the valley and their history exists. The Delta has been investigated in much greater detail.

The desert region, Klamath Basin, and Modoc Plateau are particularly depauperate of wetland and riparian inventories. The Bureau of Land Management, in their Desert Plan, has produced a source for information on existing areas, but historic land use changes are not described. Riparian losses on the Colorado River have been particularly well-researched by University of Arizona personnel.

Overall, the information base on wetlands and riparian resources is scattered and incomplete. In reviewing and analyzing data, we have been particularly careful not to assume unsubstantiated facts and make generalizations. We have attempted to compile a comprehensive document from the resources available and state whenever information gaps exist.

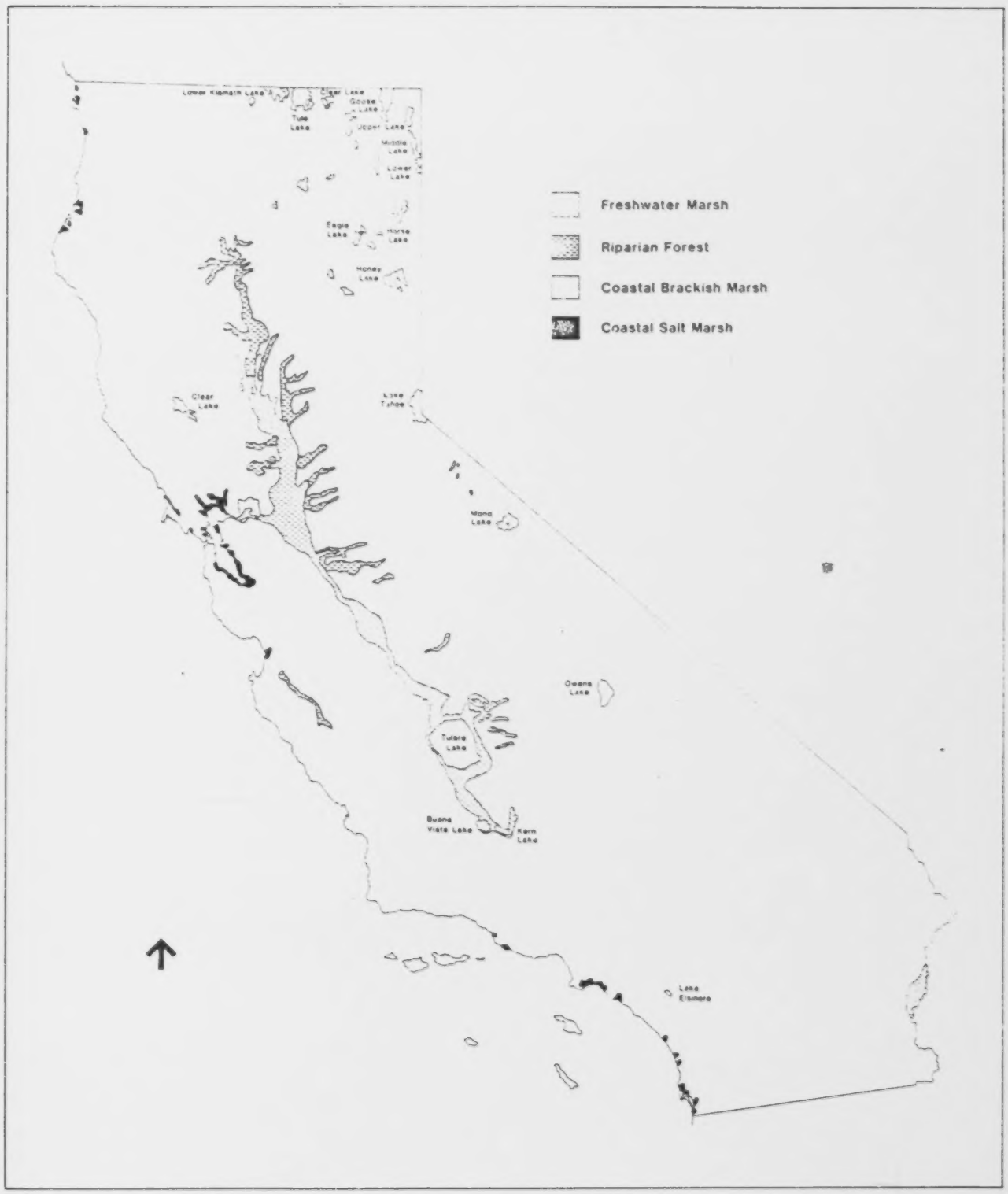
# HISTORY OF WETLANDS AND EVALUATION OF FACTORS

CALIFORNIA

California once contained an estimated five million acres of wetlands and an unspecified acreage of riparian forest (Figure 2). Four million acres of freshwater marshes and lakes covered the Central Valley and Sacramento-San Joaquin Delta. Over 380,000 acres were tidal and brackish marshes scattered along the 1,072-mile California coastline and the shoreline of San Francisco Bay. /140/ The Klamath Basin, which straddles the Oregon-California border, held nearly 190,000 acres of freshwater marsh, and patches of wetland dotted the northeastern region of the state, the Modoc Plateau. The southern desert with its arid climate accounts for the smallest proportion of marshlands.

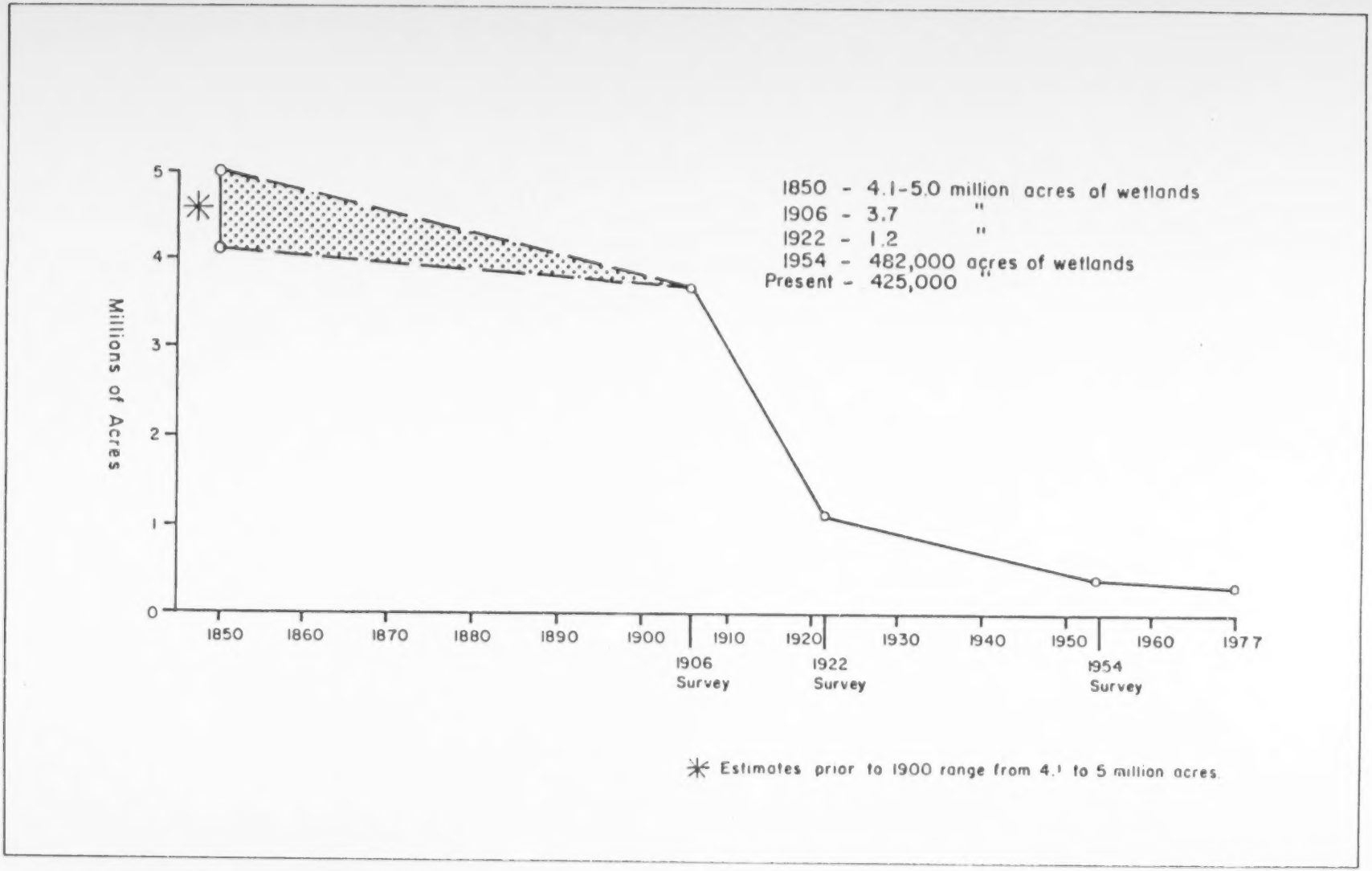
These wetlands are nearly gone, reduced by 91% statewide. /138/ The Central Valley became an agricultural center through flood control projects and reclamation of 96% of its freshwater marshes. The coast experienced varying degrees of development and reclamation. Los Angeles and Orange Counties have 10% of the original tidal wetlands with losses attributable to filling for urban use, port construction, and sedimentation from upstream development. San Francisco Bay is a similar case; 75% of the historic wetlands are filled or dredged largely for urban and industrial uses. The north and central coasts have the least disturbed wetlands partially due to the rural character of this region and lack of urban centers. However, agricultural reclamation, watershed erosion and sedimentation, and harbor development have reduced tidelands and marshes by up to 60% in certain estuaries. Over all, the coast has experienced a 70% reduction of its marshlands. /140/ Klamath Basin lost nearly 60% of its freshwater wetlands to agricultural use as did certain areas of the Modoc Plateau. Water impoundments have replaced the most extensive of desert riparian wetland resources along the Colorado River. Figure 3 depicts these losses and their attendant time periods.

Loss of wetlands and riparian areas has induced drastic population declines in 18 species which are now classified as rare or endangered by the state and federal government. /16/ Wetlands remain essential winter




SOURCE: The California Water Atlas, 1978.

**FIGURE 2**
**Historic Wetlands**
ESA/MADRONE




SOURCE: Concept Plan for Wintering Waterfowl Habitat Preservation, U.S. Fish & Wildlife Service, February 1979.

**FIGURE 3**

**Wetland Losses in California**

ESA/MADRONE

feeding grounds to millions of migratory waterfowl and shorebirds. Many other types of wildlife also depend on these habitats. In addition, they provide hunting, fishing and shellfish digging, and many other recreational opportunities.

Currently, the greatest threats to these habitats are of three types: 1) filling and dredging for urban and industrial uses; 2) continuing sedimentation and destruction of wetland areas from watershed erosion; and 3) further agricultural conversion of managed wetlands (wetlands which have hydrologic and physical characters manipulated to maximize waterfowl habitat in order to allow the greatest amount of duck hunting). Sixty-four percent of California's population lives in the coastal counties and bay area. An additional 25% are located within six miles of the coast. The majority of this population (76%) is south of Ventura County while only 3% is north of Sonoma County /140/ (See Figure 4 for locations). These populations place heavy development pressures on remaining wetlands and their watershed lands, and will continue to do so as indicated by projected increases in the southern region. Agricultural conversion is spurred by economic factors; primarily the high cost of water and taxes to maintain private managed wetlands. Sedimentation from watershed disruption occurring throughout the coast is attributable in the north to agricultural and timber harvest practices, and in the south to rapid development of lands.

## KLAMATH LAKES BASIN AND MODOC PLATEAU

### HISTORY OF WETLANDS

#### Klamath Lakes Basin

The Klamath Lakes Basin extends from southern central Oregon into northern California and lies within the Klamath River watershed. Several large freshwater lakes, upper and lower Klamath Lake, Tule Lake, Clear Lake and other smaller water bodies constitute the primary wetland areas. Tule (*Scirpus* sp) and cattail (*Typha* sp) marshes once surrounded the large bodies of water and their tributaries. Freshwater wetlands and lakes totaled 189,000 acres in 1899 and served as a major nesting area for waterfowl (approximately 6 million ducks and geese per year) and as summer habitat for numerous other migratory species. /134/

The advent of white settlement in the 1850s brought reclamation of wetlands for agricultural use; grain and pasture land dominated, and there was limited production of crops such as barley and potatoes. Conflicts between white homesteaders and the Modoc Indian tribe extended over a 21 year period. Agricultural expansion and reclamation activities slowed during this time but subsequently continued on the flat, basin lands.

The early 1900s brought an era of increased preservation and reclamation of the Klamath basin. Beginning in 1908, the federal government took an active role in setting aside wetland areas as national wildlife refuges (NWR). Five refuges were created between 1908 and 1960: Tule Lake, Lower Klamath, Upper Klamath, Klamath Forest, and Clear Lake.

In 1908 President Theodore Roosevelt established the Lower Klamath Lake NWR by executive order. Originally encompassing 81,619 acres the refuge held great numbers of nesting waterfowl which were annually harvested for export to San Francisco. In addition the millinery trades paid high prices for the plummage of certain species including herons, egrets, grebes, and terns.

TABLE 2

KLAMATH LAKES BASIN WETLANDS

| Refuge | History | Acreages Total | Water & Wetland | Cropland | Upland | Waterfowl Production Between 1977-81 Ducks, Geese & Coots |
|---|---|---|---|---|---|---|
| Lower Klamath Lake NWR | - Established in 1908 and held 81,619 acres<br>- Subsequent federal reclamation projects converted over 64,000 acres to agriculture | 65,166 | 17,583 | 47,583 One-third of grain left unharvested as waterfowl food source | -* | 27,634 |
| Upper Klamath Lake NWR | - Established in 1928 and held 8,140 acres<br>- Additional purchases in 1954 | 14,850 | - | - | - | 7,554 |
| Tule Lake NWR | - Originally held 90,000 acres of wetland<br>- Established in 1928 of 11,000 acres of reclaimed land flooded by irrigation water<br>- Additions in 1932 and 1936 enlarged to 37,340 acres | 37,340 | 13,200 | 17,400 | 7,518 | 15,091 |
| Clear Lake NWR | - Established in 1911 and managed as irrigation reservoir | 33,400 | - | - | - | 997 |
| Klamath Forest NWR | - Established in 1960 | 16,376 | 14,776 | - | 1,600 | 4,615 |
| Meiss Lake WMA | - Established in 1981 | 13,000 | - | - | - | - |

* - indicates figures are unknown.

Accompanying the federal effort to preserve wetlands was the conflicting charge of the Bureau of Reclamation to manage the water resources in the basin for creation of additional agricultural lands. In 1915 and 1921, presidential executive orders withdrew large areas of wetland and lake from the Lower Klamath Refuge for reclamation to agriculture. The Bureau of Reclamation diverted the Klamath River away from Lower Klamath lake; within 44 years the lake had dried up. Subsequent reflooding in 1942 of certain areas by water pumped from Tule Lake has created a managed wetland habitat of 17,583 acres. In addition, croplands within the refuge comprise 47,583 acres; one-third of the grain produced within the refuge is left unharvested for waterfowl food. Waterfowl production is significant and highest amongst the area's refuges (27,634 ducks, coots and geese between 1977-81).

The Upper Klamath National Wildlife Refuge established in 1928, contains 8,140 acres of wetlands and lakes from the original purchase and an addition of 4,397 acres from a 1954 purchase. Other smaller purchases make the total acreage of 14,850 acres along the northwestern side of Upper Klamath Lake. There are extensive reclaimed agricultural lands surrounding the lake. As recently as 1960, 14,000 acres of private wetland on the lake was diked off for agricultural usage. Waterfowl production totaled 7,554 ducks, geese and coots between 1977 and 1981.

Tule Lake which once held 90,000 acres of water and wetlands, was largely reclaimed in the early 1900s for agricultural use through diversion and impoundment of Lost River, the lake's water source. The refuge, established in 1928, consisted at that time of 11,000 acres of sumpland inundated by surplus irrigation water. Additions in 1932 and 1936 enlarged the refuge to 37,340 acres. A considerable proportion of the refuge, 17,400 acres, is now leased as crop and grazing land with 13,200 acres of marsh and water and 7,518 acres of upland remaining. Waterfowl production is quite large, with a total of 15,091 ducks, geese and coots for the 1977-81 period.

Clear Lake National Wildlife Refuge includes 33,400 acres and lies in the dry grasslands of Modoc County. Established as a national wildlife refuge in 1911, the lake has been used for irrigation purposes, causing water levels to fluctuate sufficiently to preclude the growth of shoreline emergent vegetation. Waterfowl production consequently is quite low (997 ducks, geese and coots in 1977-81) and several other species (gulls, terns and cormorants) nest on islands in the lake.

Klamath Forest National Wildlife Refuge contains 14,776 acres of marsh and water and 1,600 acres of upland. The 16,376-acre refuge was established in 1960 and had waterfowl production of 4,615 ducks, geese and coots between 1977-81.

Several large areas of marshland are held in private ownership: Miller Lake, Swan Lake, Aspen Lake, Alkali Lake and areas around the Lower Klamath. /165/ In addition, numerous small, unmapped wetlands dot the basin area.

The California Department of Fish and Game acquired in 1981 a wildlife area at Meiss Lake. This 13,000-acre reserve has several hundred acres of freshwater marsh; the reserve manager has just completed a plan for creation of managed wetlands on the lake. /177/

Overall, the wetland and water acreage of the Klamath River Basin has been reduced from an original estimated 189,000 acres in 1899 to 81,049 acres in national wildlife refuges, with an unspecified acreage of privately owned wetlands. Although national wildlife refuge holdings total 151,375 acres, approximately half of these acres are in croplands or are uplands with limited use to waterfowl.

The most significant change brought about by this reduction is a loss of waterfowl habitat and accompanying reduction from peak seasonal concentrations of 6 million waterfowl to 1 million waterfowl. These present concentrations are still among the greatest in the United States, and over 80% of the waterfowl population of the Pacific Flyway use the basin wetlands during their migrations. /134/

The majority of wetlands reclamation both within and outside of federal holdings occurred between 1900-1950. One large area (approximately 14,000 acres) along the northern edge of Upper Klamath Lake was diked and reclaimed in the 1960s. /165/ Small privately owned wetlands continue to be threatened with the continual need for expansion of agricultural lands. The requirements for irrigation water also make continuous demands on lakes and rivers of the area, limiting the growth of shoreline vegetation. The change from hay and grain production to alfalfa and other crops affects bird populations by reducing the amount of unharvested grain available as food. Conversion of agricultural land or wetlands to urban uses is not a significant trend in this region.

Modoc Plateau

The Modoc Plateau is a semi-arid region containing lava flows, high mountains and alkaline lake beds. Major wetland and riparian areas are found in a few specific areas: the Devils Garden Plateau of the Modoc National Forest, the Honey Lake plain and other large lakes. The Devils Garden Plateau historically held only 3,400 acres of wetlands. /142/ These were both permanent and intermittent freshwater marshes occurring in depressions in the lava rock of the plateau. /142/ Since the 1850s and settlement of the region, ranchers constructed earthen dams across small streams, thus impounding water for irrigation and livestock and also creating marsh vegetation as forage. The natural vegetative cover of juniper and silver sage is not a productive plant type for cattle grazing; the short emergent marshes created around these impoundments contain rushes (*Juncus* sp.) and spike rush (*Eleocharis* sp.), more desirable grazing plants. Since the early 1900s, when many of the early dams were built, the Forest Service has acquired much of this land.

Although not originally intended as waterfowl enhancement projects, these wetlands serve as nesting areas for many species. In 1965, the Forest Service began to improve many of the wetlands as well as construct new impoundments with the added intention of creating waterfowl habitat. This program continues today using both private and federal

funding and creating an average of one wetland per year. Presently there are 34,000 acres of wetland in the Modoc Forest, including 15,000 acres of permanent wetlands (those receiving year-round water) and 19,000 acres of intermittent wetlands. Sizes range from the 6,000 acre Big Sage Reservoir to 5-acre ponds. Sixty of these wetlands are permanent and 220 are intermittent, filling with seasonal rainfall and drying during summer months. The Forest Service personnel who direct this program estimates that an additional 8-10,000 acres of wetland could be created in the forest. However, much of the program's current effort is concentrated on restoring previously impounded areas by repairing eroded spillways, deepening pools, and changing intermittent wetlands to permanent wetlands. In order to improve nesting habitat for waterfowl, islands are created and a capacity for year-round water insured. Shoreline nesting cover is also supplemented if needed. A similar program is just underway in the Klamath National Forest; forest biologists are devising plans for wetland creation.

Several other large water bodies on the Modoc Plateau have limited areas of wetlands. Goose Lake has bulrush marsh along its western shore; Alkali Lakes in Surprise Valley are lined by salt grass. Doris Reservoir and Pitt River in Modoc National Wildlife Refuge provide marsh habitat for waterfowl. /200/ Some of the lakes are alkaline, dominated by salts of calcium rather than sodium and not conducive to extensive vegetative growth. /200/ Honey Lake, a large alkali lake in southern Lassen County, is filled by agricultural irrigation return water.

The first irrigation projects, begun in the 1800s, allowed for diversion of the Susan River and greater agricultural development along the lakeshore. The northwestern plain bordering Honey Lake is farmed, as is the southwest shore. Grain, remaining after the harvest, provides food to waterfowl who use the lake and wildlife area. California Department of Fish and Game maintains a 6,000-acre wildlife area near the shore and raises grain for waterfowl. /200/ Duck clubs in the Modoc Plateau number 22 covering 43,256 acres. Of these, 10,080 acres are farmed, and 32,236 acres provide marshland habitat. /135/

Riparian vegetation lines the larger rivers in the Modoc area where year-round water supplies are sufficient to support this vegetation. The Pitt and Susan rivers have riparian borders to some extent. Flood control impoundments and channels on the Pitt River have caused some loss of riparian vegetation. /200/ In the Modoc area, pressure to convert wetlands to either agricultural uses or urban uses is minimal. /200, 202/ Many of the wetland soils are too alkaline and thus unsuited for crops; or the wetlands are small, remote, and scattered. Overall, the Modoc Forest program is increasing the acreage of wetlands in this region.

Two fish species, the shortnose sucker and Lost River Sucker are currently endangered due to loss of habitat in the Klamath Basin from water diversions. Filling of wetlands and water diversions have decreased the habitat of the Modoc sucker, an endangered species.

EVALUATION OF FACTORS

The economic base of the Klamath Basin is largely agriculture with many productive cultivated lands derived from former wetlands. Grains, native hay, and alfalfa are the principal crops; late potatoes and barley are also produced. Much of the hay, grain and alfalfa are grown for the local cattle ranches which stretch over the drier adjacent country. Barley produced near Tule Lake is exported to breweries; this region is also the only west coast producer of durum wheat.

Although farming and reclamation began in the 1800s in the basin, large scale conversion of wetlands was stimulated by the water diversions and impoundments created by the Bureau of Reclamation in the 1900s. In addition this area held some of the only land available for homesteading after 1900. World War I veterans were awarded homesteads of 80 acres on the reclaimed wetlands of Tule Lake. /55/

Since the 1930s, the trends in farming have consisted of consolidating 80-acre parcels into larger ranches, and continuing use of most forage crops for local cattle ranching. /144/ Some agricultural expansion has occurred recently, both within and outside the National Wildlife Refuges in wetland areas. Census figures show that population distribution has continued to remain sparse. Nominal increases in these areas have maintained the demand for urbanization at a low level.

In the Modoc Plateau, the Honey Lake Plain is the major producer of alfalfa, supplying winter feed for local cattle, and other crops, including wheat, barley, rye and potatoes, Most crops are used locally, and cattle ranching is the predominant occupation.

Some recreational activities are centered in Modoc National Wildlife Refuge, Eagle Lake and Honey Lake State Wildlife area. In addition, the waterfowl nesting habitat provided in Modoc National Forest produces waterfowl whose value is realized in hunting areas of the Central Valley. Hunting is not a major activity directly in these wetlands. Population in the region has shown few increases, and urban development of flat wetland areas is not occurring.

Major technological improvements which have promoted conversion of wetlands involve water management, primarily increased water diversion and impoundment. Although diversion of water supply sources dried up many marshlands in the basin, the creation of a tunnel for transporting water from Tule Lake to the Lower Klamath permitted water to be redirected to the managed wetlands there.

With the exception of changing technologies in irrigation practices, water impoundments, and diversions, few changes have prompted wetland conversions other than presently exist on the Modoc Plateau. Improved water impoundments have in fact been used to create wetlands in the National Forest. The lack of large areas of suitable arable land has greatly limited the expansion of agriculture into alkaline wetlands. Changing irrigation practices have, however, lead to replacement of grain fields by alfalfa in the Honey Lake area, thereby eliminating an important waterfowl food source. /202/

Social attitudes towards wildlife, especially toward waterfowl, have played an important role in the preservation of Klamath Basin and Modoc wetlands. The demands, first of hunters and secondarily of campers and bird watchers,have been fulfilled by the continuing preservation and management of wetlands under the National Wildlife Refuge system and under other federal and state ownership. /204/ Public use of the reserves partially reflects their social value.

TABLE 3

PUBLIC USE - CALENDAR YEAR 1981

KLAMATH BASIN NATIONAL WILDLIFE REFUGE

| | | | Harvest Figures | | |
|---|---|---|---|---|---|
| | Total Visits | Hunter Visits | Ducks | Geese | Pheasants |
| Tule Lake | 187,550 | 11,818 | 12,387 | 5,573 | 1,106 |
| Lower Klamath | 144,700 | 11,743 | 19,486 | 2,190 | 1,566 |
| Upper Klamath | 3,695 | 875 | | | |
| Klamath Forest | 3,975 | 90 | | | |
| Clear Lake | 470 | 100 | | | |

Source: Robert Field, Manager, Klamath National Wildlife Refuge

TABLE 4

SUMMARY OF VISITOR ACTIVITIES

MODOC NATIONAL WILDLIFE REFUGE

| | Total Visits | Waterfowl Hunter Visits | Activity Hours |
|---|---|---|---|
| 1981 | 20,983 | 2,596 | 12,035 |
| 1980 | 42,190 | 3,267 | 11,017 |
| 1979 | 34,958 | 2,531 | 9,802 |
| 1978 | 32,909 | 2,446 | 8,950 |
| 1977 | 18,442 | 3,257 | 12,734 |

Source: Manager, Modoc National Wildlife Refuge

TABLE 5

SUMMARY OF VISITOR ACTIVITIES

HONEY LAKE STATE WILDLIFE AREA

| Year | Hunting | Fishing | Sightseeing | Bird Watching | Nature Study | Camping |
|---|---|---|---|---|---|---|
| 1981-82 | 2,823 | 1,344 | 1,150 | 1,262 | 266 | 88 |
| 1980-81 | 5,114 | 1,104 | 1,240 | 975 | 215 | 192 |
| 1979-80 | 4,187 | 1,091 | 1,051 | 975 | 270 | 102 |
| 1978-79 | 4,300 | 648 | 1,593 | 989 | 393 | 57 |
| 1977-78 | 3,405 | 648 | 1,470 | 961 | 535 | 252 |
| 1976-77 | 3,918 | 795 | 1,428 | 1,009 | 293 | 180 |

Source: Robert Weld, Manager, Honey Lake State Wildlife Refuge

## NORTH AND CENTRAL COAST

### HISTORY OF WETLANDS

This region extends from the Oregon border to Monterey County and has several significant wetland areas and a great acreage of riparian vegetation. North and central coastal wetlands are of several types: large bays and lagoons, small estuaries at the mouths of rivers and creeks, and lakes and lagoons formed behind dunes and beaches. North coastal salt marshes are dominated by pickleweed (*Salicornia pacifica*), with cordgrass (*Spartina foliosa*) fringing lower intertidal zones only in certain coastal wetlands. The upper elevations of the pickleweed marsh contain other halophytic species such as arrowgrass (*Triglochin maritima*), sea lavender (*Limonium Californicum*), and saltgrass (*Distichlis spicata*). Brackish marshes are not uncommon in river back waters and the upstream portions of estuaries. Common species include: slough sedge (*Carex obnupta*) and Lyngby's sedge (*Carex Lyngbyii*), alkali bulrush (*Scirpus robustus*), pacific silverweed (*Potentilla pacifica*), hair grass (*Deschampia caespitosa*), and others.

Within the lower intertidal zone, eelgrass (*Zostera marina*), a submerged aquatic plant, is in many northern estuaries. Freshwater marshes of thick stands of cattails (*Typha* spp.) are most often encountered but are also mixed with other species such as water parsley (*Oenanthe sarmentosa*), rushes (*Juncus* spp.), and bulrushes (*Scirpus* spp.). /118, 66/

Riparian forests of alder, cottonwood, willow and other species line many miles of waterways on the north coast. The distribution and extent of these forests is largely undocumented, and only areas of particular significance or issue are discussed here.

The coastline is distinguished by four subregions which are convenient geographic units for a detailed discussion of wetland resources. These include: Del Norte and Humboldt Counties, Mendocino County, Sonoma and Marin Counties, and San Francisco, San Mateo, Santa Cruz and Monterey Counties. (see Figure 4).

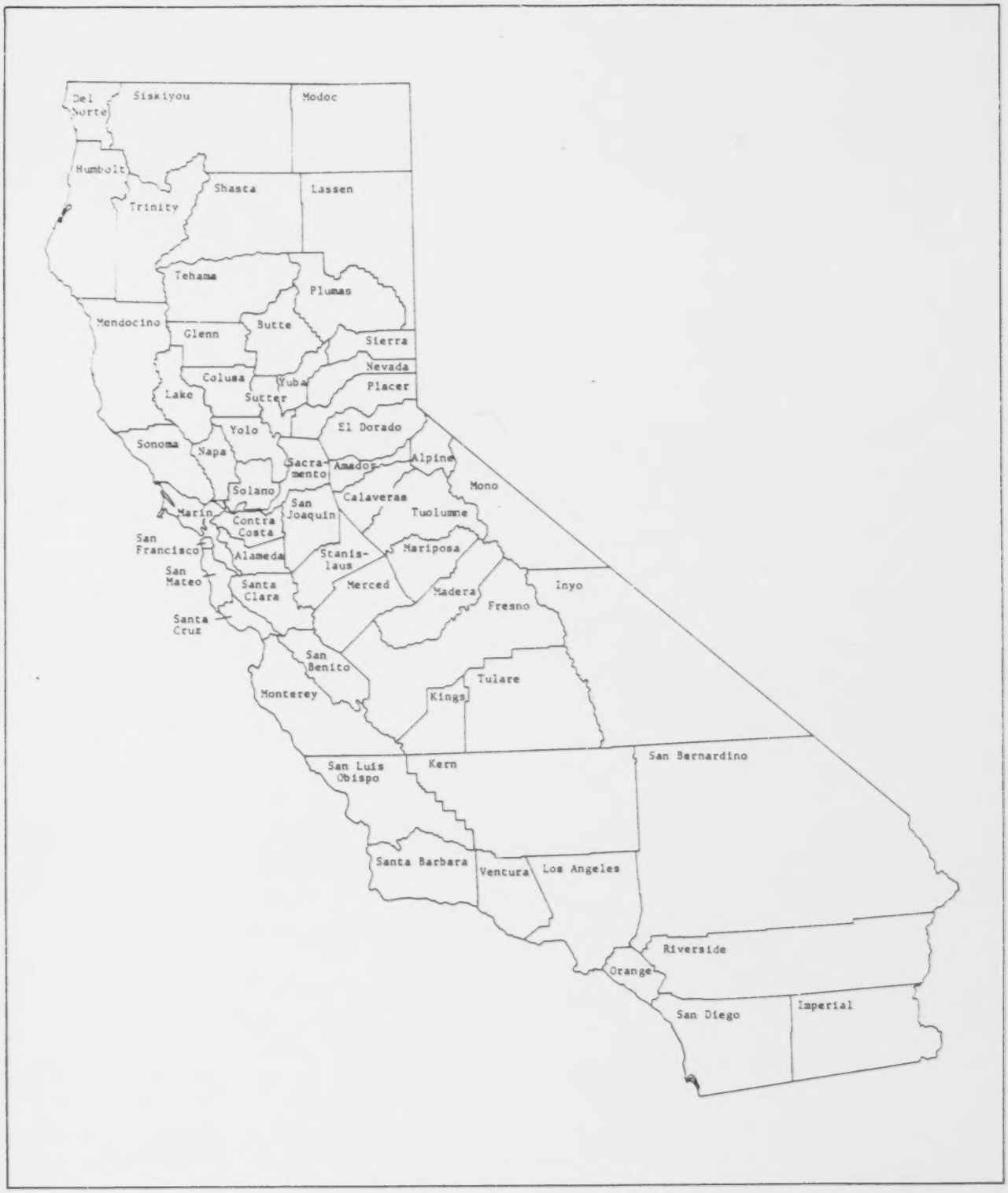



**FIGURE 4**

**Counties of California**

ESA/MADRONE

Urban growth along the north and central coasts has been confined to particular cities; agricultural and silvicultural land uses still dominate the region. San Francisco, Santa Cruz and Monterey Counties, Humboldt and Half Moon Bays are the most developed areas, with other settlements scattered over the coastline.

Del Norte and Humboldt Counties

The two large river systems, the Smith and Klamath, of Del Norte County contain the majority of the wetland and riparian acreage. The Smith is the northernmost river and the only large drainage in California without a major dam. Within the 28,000-acre coastal flood plain of the river are two areas of wetland, the Smith River delta and Lake Earl. The tidal delta covers 8,300 acres and the freshwater lake includes 2,300 acres. The original acreages of marshland are not known, but both areas held great populations of waterfowl and tule elk which supported local indian tribes.

Concurrent with the mining of gold in inland regions, the harbor at Crescent City developed. Timbering in the coastal forests began and a mill operated in Crescent City. The new settlement created a demand for farm products,and by 1900,75% of the Smith River delta lands were converted to agricultural use. Lake Earl became a storage pond for logs before transport to nearby mills. /70/

The Smith River delta is now a mosaic of farmlands (6,400 acres) and former slough channels lined with riparian (608 acres) and freshwater vegetation (115 acres). The main river contains 302 acres of intertidal flats along its lower two miles. The majority of agricultural lands are pasture and grassland. In winter months the sloughs and lower elevation farmlands pond water. These ponded fields provide important habitat to wintering waterfowl. Three-hundred cultivated acres produce lilies and daffodils, a high income crop. Lake Earl is surrounded by 1,357 acres of freshwater plants of both submerged and emergent varieties. Agriculture has claimed 4,500 acres. /70/

The Smith River is a primary stream course for salmon and steelhead,affording 350 miles of spawning and nursery habitat. Both anadromous and marine fish species inhabit Smith River and Lake Earl. The majority of the delta is in private ownership, and conversion to urban uses does not constitute a great threat. /70,144/ The Smith River is a designated wild and scenic river, but mining and logging are widespread in the watershed. Consequently, sedimentation of the delta area could silt in wetland and intertidal areas. /70/ No major flood control projects or navigational dredging projects have been completed on the Smith and none are planned for the near future. /51/ Lake Earl is largely owned by the California Department of Fish and Game as a wildlife area (2,130 acres). A residential subdivision occurs on the north shore.

The Klamath is the second largest river system in the state; its large freshwater outflows scour the mouth and preclude deltaic formations. Therefore, the Klamath has only 300 acres of freshwater/brackish marsh near the mouth and approximately 100 acres of mudflat. Riparian forests extend along portions of the 263 miles of its main channel; tributaries also contain riparian vegetation. The degree to which these forests have been disturbed is unknown. Urban developments are small and few in the watershed,and logging of the coniferous forest is the primary land use. /42/

This river has served as a major interstate transportation corridor between the Klamath Lakes basin in Oregon and coastal California settlements. Few impediments to river travel exist today. /42/ The Klamath is a state-designated wild and scenic river,and no major flood control projects are planned for it. Other small wetlands of Del Norte County are distributed along Elk Creek in Crescent City, Marhoffer Creek, and Crescent Beach. /125/

Humboldt County has several large estuaries Humboldt Bay, and the Eel River delta, as well as many smaller wetlands. In the northern portion of this large county are a series of coastal lagoons and small estuaries. Freshwater, Stone, Dry, and Big Lagoons all have brackish

and freshwater wetlands; several have large open water areas. Freshwater Lagoon contains 75 acres of freshwater marsh and 170 acres of open brackish water. Stone Lagoon, located two miles south of Freshwater Lagoon, contains 170 acres of brackish marsh and 351 acres of open water. Dry Lagoon is composed entirely of brackish wetlands totalling 80 acres. The California State Department of Parks and Recreation owns all three lagoons and those with open water are used for fishing, waterskiing, and boating. /71/

Big Lagoon, the southernmost and largest of the lagoons, encompasses 520 acres of brackish marsh, 50 acres of freshwater marsh, and 900 acres of open water. The California Department of Parks and Recreation acquired Big Lagoon as an ecological reserve with limited public access. The watershed of all these lagoons have been heavily logged and continue to deposit sediment into the lagoons. /11/

Redwood Creek and Little River estuaries and Espa Lagoon are all smaller wetland areas located north of Humboldt Bay. /25/

The Mad River has an estuary of 100 acres. The lower river valley was cleared of riparian woodlands and converted to agricultural lands during the 1850s in connection with the development of Humboldt Bay and the region's logging industry. During this same period, a slough was constructed between the Mad River and adjacent Mad River Slough (a part of Humboldt Bay) to transport logs. The canal silted in after 30 years and was abandoned. /115,118/The original acreage of wetlands and riparian acres is unknown.

Humboldt Bay is the largest estuary and wetlands complex in California north of San Francisco. It also contains a substantial proportion of the wetland acreage remaining on the coast. The bay consists of two wide shallow northern and southern arms connected by a relatively narrow channel. The bay surface and its surrounding wetlands once covered 27,000 acres. Agricultural, harbor, and urban development has reduced the acreage by 37% to 17,000 acres. /68/

Beginning with the founding of the town of Eureka in 1850, Humboldt Bay has been the shipping center for the north coast region. Gold exports from the Trinity River, mills for lumber from the surrounding mountains, and the local fishing industry all centered on the bay shoreline. The Army Corps of Engineers dredged several deepwater shipping channels in the bay during the 1880s. By 1900, lumber mills, fish canneries, and harbors lined the western and portions of the eastern bayfront. Expansion of the lumber mills during the 1940s continued to encroach on wetland areas. /47/

The completion of the railroad in 1901 greatly spurred agricultural reclamation with the railroad berm functionally diking off certain tidal wetlands. In the northern and eastern bay, large areas of tidal marsh were diked off and converted to pastureland by 1930. /68/ A total of 14,000 acres is now agricultural lands. /118/ Some of these low elevation lands pond water during winter rains and provide good waterfowl habitat.

The cities of Eureka and Arcata covered wetlands and both developed extensive wharves during the shipping boom of the 1800s. The changing land uses around Humboldt Bay have been well-documented and are summarized below:

LAND USES IN ACRES

| Year | Open Space | Agriculture | Wetland | Commercial and Industrial | Residential |
|---|---|---|---|---|---|
| 1871 | 17,269 | 3,049 | 8,738 | 0* | 250 |
| 1948 | 8,574 | 17,302 | 1,337 | 1,048 | 2,332 |
| 1958 | 8,467 | 14,905 | 1,136 | 1,595 | 3,616 |
| 1969 | 8,650 | 13,657 | 1,128 | 2,265 | 3,977 |
| 1978 | 8,372 | 13,750 | 1,108 | 2,239 | 4,171 |

*There were probably some mills in existance in 1871, but none are identified on the 1871 map.

SOURCE: U.S. Army Corps of Engineers. 1980. Humboldt Bay Wetlands Review and Baylands Analysis. Vol. I.

Tidal and freshwater wetlands have decreased from an original acreage of approximately 7,000 acres to between 600 to 970 acres. Brackish and freshwater marshes cover 250 acres and 170 acres, respectively. /68,128/ Intertidal areas are extensive in both the north and south bay totalling approximately 7,200 acres. Eelgrass beds, an uncommon habitat type on the coast, cover 2,935 acres in both areas of the bay. Riparian woodland once bordered tributary streams and was cleared for building. Isolated groves of ten acres or less remain scattered over upland areas. /118/

Overall, between the years 1871 to 1948, agricultural relamation of wetlands increased; however, the years 1948 to 1978 saw a decrease in agricultural land area and expansion of urban areas. Urban expansion does not currently represent a great threat to Humboldt Bay wetlands or diked agricultural lands. Predicted expansion of ports and and small craft harbors may encroach into wetland areas somewhat. /47/ Logging within the watershed has fostered sedimentation of tidal channels within the bay; this process may be continuing to effect tidelands. /68/

Oyster mariculture has been practiced in the intertidal flats of the north bay since the late 1800s and continues to be a viable industry. Waterfowl hunting and sportsfishing are major uses of the bay's wetland and tidal areas.

The tide and submerged lands and marshes of the bay are owned by a variety of state, local, and federal entities and many private parties. Humboldt Bay National Wildlife Refuge has authorization to acquire 7,814 acres in five separate units; however, only 531 acres have been acquired thus far. /188/ Several local shoreline parks are also in the planning stages. /47/ In addition marsh restoration projects have occurred in Humboldt Bay as mitigation for developments.

The Eel River Delta in southern Humboldt County extends upriver for seven miles and encompasses an area of 33,000 acres. The delta was once a maze of waterways, riparian vegetation, and large tracts of tidal and brackish marshland. With the influx of American homesteaders during the 1850s, the delta lands were diked and farmed. Potatoes were the first major crop in the area, and Port Kenyon, a few miles upstream from the river mouth, became the central harbor. However, with the advent of logging in the 3,800 square mile Eel River watershed, sediment loads increased and by the early 1900s, the channel to Port Kenyon was not navigable for moderate sized ships. The potato farms became pasture-land and dairy and cattle ranching continue to be the primary uses of the delta lands.

Agricultural development reclaimed 21,700 acres of wetland and riparian lands in the delta; residential and commercial lands total 2,600 acres. Of the agricultural lands, 10,800 acres are poorly drained pasture and retain some value as wintering waterfowl habitat. Salt and freshwater marshes which remain account for 1,050 acres, and riparian woodlands of high habitat quality take up 2,500 acres. Open water areas cover 2,300 acres, and intertidal mudflats compose 500 acres. /69/

The Eel River and delta are important streams for anadromous and estuarine fish species. Over 136 miles of waterways in the delta are used by sportfishermen. Waterfowl hunting is also a significant use of the delta in both private duck clubs and public areas. The majority of the delta is in private ownership, excepting a 170-acre wildlife area owned by the California Department of Fish and Game. This area is not subject to pressure for urbanization; agriculture remains the dominant land use. Remaining riparian areas, though, are threatened with removal to increase areas of grazing land. /203/ Construction of the proposed impoundment at Dos Rios and diversion of large quantities of water could drastically change the hydrology of the lower river and delta. /69/

In the southernmost area of Humboldt County are the Bear and Mattole Rivers, which drain the steep coastal mountains south of Cape Mendocino. Both have small estuaries of less than 100 acres and little wetland vegetation. The Mattole River does have significant riparian woodlands of unknown acreage. /11/

Del Norte and Humboldt Counties are not presently undergoing population increases of any significance, and threats to wetlands arise largely from watershed practices, agricultural clearing, and harbor expansion.

Mendocino County

The jagged rocky Mendocino coastline contains no large embayments or deltas but rather is characterized by narrow, v-shaped river canyons opening into tidal river mouths containing wetlands and mudflats. The most significant of these are the Ten-Mile River, Noyo River, Big River, Albion River, Navarro River, Garcia River, and Gualala River. Numerous small creeks incised along this coast contain between 2 to 20 acres of wetlands and mudflats, and most are overgrown with riparian vegetation.

The Ten Mile River drains a small area, and for its lower two miles is tidally influenced. A large tract of salt and brackish marsh occupies the last bend in the river with several small areas bordering the river channel. Marshes and mudflat together equal over 100 acres, and riparian woodlands form thick corridors along the channel for several miles. The wetlands have undergone two significant changes. Sediment, associated with the logging of the watershed has silted in several of the wetlands isolating them from tide water. In addition, sheep have grazed on several of the marshes, changing the vegetative composition. /63/ Riparian forests have expanded in recent years, overgrowing river bars formerly mined for gravel. Currently no development plans are proposed for these privately owned wetlands, and the Department of Fish and Game has listed this area as a high acquisition priority. /8/

South of the Ten Mile River is a large system of coastal dunes which contain several dune lakes and the Inglenook Fen. These dunes and the fen are owned by the California Department of Parks and Recreation. /15/

The Noyo River, adjacent to the town of Fort Bragg, once held a larger area of wetlands but was developed as a commercial fishing harbor approximately 20 years ago. Although tidal influence extends two miles upriver, little marsh is left (9 acres). Riparian woodlands stretch along the channel for several miles in the undeveloped areas. /15/

Big River is amongst the largest river systems on the Mendocino coastline and has the longest estuary. Tidal influence extends up to 8.5 miles upstream in summer months. The river in its lower four miles occupies a broad floodplain lined with salt and brackish marshes and mudflats totalling over 200 acres. /15/ Several freshwater marshes dot the river floodplain, and eelgrass beds are extensive in the lower two miles. Riparian woodlands border the river for over 20 miles upstream, extending into the narrow forested canyon.

Logging has been the primary land use in the watershed, for the past 130 years. The long-term effects of sedimentation from timber harvesting are well-documented for this estuary. The estuarine channel has shrunk by as much as forty feet in width, and over half of the original salt marsh acreage has been silted in and isolated from tide water. /62/ A 10-acre fill is located near the river mouth at the former site of the lumber mill. Major threats to the estuary continue to occur from siltation, attendant with logging operations which are now occurring on the slopes bordering the marshes. No other maior developments are proposed in the prvately owned drainage. This estuary is also a top priority for acquisition by the Department of Fish and Game and has been nominated as a National Wildlife Refuge under the U.S. Fish and Wildlife Serve Endangered Ecosystems Program.

The Albion River is a small waterway draining steep-sided canyons of coniferous forest. Mudflats line the lower 45 miles of the river,

and small crescents of salt marsh border the channel. Wetlands and mudflats total over 100 acres. Twenty-eight acres of eelgrass beds cover the intertidal flats and are amongst the most extensive in this region. A small craft marina replaced approximately 12 acres of wetland at the river mouth and residences are scattered on the shoreline near the mouth. Sedimentation from logging operations has caused some accretion along the narrow channel and continues to threaten the estuary. / 63, 15/

The Navarro River, as it descends from the narrow canyons of its upper tributaries, stretches out over a broad floodplain in its lower reaches (3.5 miles). Large areas of riparian forest and narrow strips of salt marsh cover the floodplain. Marsh and mudflat total 20 acres and are largely undeveloped. The estuary has been modified by early homesites, construction of the adjacent highway, and logging of the watershed. /15/ The California Department of Fish and Game owns 77 acres near the river mouth and manages the area as an ecological reserve.

The Garcia River in southern Mendocino County contains a large area of dunes and marsh at its mouth and over 200 acres of riparian woodlands in its lower three miles. Much of the former wetland area has been converted to grazing land; remaining salt and brackish marshes (64 acres) are grazed during summer months. Over half of this 570-acre estuary is pastureland. In addition to grazing, logging in the watershed and siltation has affected the tidal flats. /15/

The Gualala River forms the dividing line between Mendocino and Sonoma Counties. Tidal inflows extend to two miles upstream, and freshwater and brackish marsh are scattered over the lower floodplain and amongst the sand dunes at the mouth. The wetlands total 20 acres; recreational developments and logging operations have disrupted these marshes in the past. /15/ Sonoma County Regional Parks owns a portion of the river mouth; the majority of the watershed is privately owned.

Upstream water diversions to the nearby Sea Ranch recreational subdivision threaten the summer hydrologic regime of the estuary and its quality as fish habitat.

The rivers of Mendocino County represent a significant proportion of the anadromous fish spawning and nursery habitat in California. The estuaries, due to their relatively undeveloped state, serve as anadromous and marine fish nursery grounds as well as habitat for migratory water birds and other water-associated wildlife (e.g., river otter, beaver, osprey, and harbor seals). The greatest change to the estuaries of the Mendocino Coast has come from sedimentation associated with logging and agriculture in adjacent watersheds. Unlike the large river systems of Del Norte and Humboldt Counties, with great freshwater outflow, these rivers are of moderate size with summer and winter tidal intrusion. This hydrologic regime appears to foster sediment deposition within the tidal portion of the river with accompanying impacts on wetland and mudflat areas. /62,63/ In contrast, the larger rivers tend to deposit sediment loads in the upper freshwater portions of the channel with less deposition occurring in estuarine areas.

Urban growth does not represent a threat to Mendocino County wetlands at present; however, future development of recreational facilities could disturb certain river systems. Logging and watershed disturbance continue to produce sediment loads which impact estuarine and wetland resources.

Sonoma and Marin Counties

The wetlands of Sonoma and Marin Counties are primarily large embayments or small lagoons fed by coastal streams and rivers. The Russian River is the largest river in Sonoma County, with a watershed of 1,485 square miles. The river mouth sporadically closes during summer months, forming a small lagoon which encompasses 200 acres with an additional 100 acres of adjacent marshland. Gravel was mined from the lagoon during the 1960s. /12/

Although agricultural clearing and resort development have replaced some riparian woodlands, riparian forests line large areas of the floodplain. Gravel mining has caused bank erosion and some loss of riparian vegetation. The exact acreage of remaining riparian forests is not known.

Bodega Harbor encompasses an 880-acre embayment fed by a small watershed of 7 square miles. Russians first settled this area as a furtrapping station and left in 1841 following conflicts with the then ruling Mexican government. The harbor was originally a deep water port, and marina facilities were built around 1841 to export agricultural products and lumber. Potatoes became a principal crop and the harbor a primary shipping point to San Francisco. However, during the late 1860s, accelerated sedimentation of the harbor resulted from upstream agricultural land practices and coupled with depletion of local forest resources, greatly reduced the harbor's prosperity. Dairies replaced potatoes and Bodega Harbor became a modest fishing village. By 1862, tidal flats covered 643 acres of the 1,064-acre harbor.

The harbor is now a shallow bay with 500 acres of mudflat comprising nearly 60% of the harbor water surface. A small, 72-acre parcel of salt marsh remains along the southeastern shore. A small amount of marsh may have been present along the shoreline in 1840, but many formed at creek deltas by 1931. Dredge spoil disposal and shoreline developments have since filled some of these wetlands and approximately 100 acres of tidal flats. Eelgrass beds cover over one half of the tidal channels, accounting for 184 acres. /110/

The harbor now attracts recreationists and tourists and continues to support a commercial fishing fleet. Clamming and fishing are popular activities as are camping and hiking at the two Sonoma County parks located on the harbor. Scientific research on the harbor is centered at Bodega Marine Laboratory. Threats to the tidal flats and wetlands

arise primarily from continued sedimentation, over use of clam beds, and continued harbor and resort development and maintenance dredging.

Estero Americano forms the dividing line between Sonoma and Marin Counties. Estero de San Antonio, located just south, is smaller and similar in form. Both esteros flow through relatively steep hills and consequently have only small alluvial flats bordering their channels. They are "fiord-like" in their formation and both have seasonally blocked outlets. Estero Americano contains 391 acres of brackish marsh, 301 acres of open water, and 49 acres of riparian forest. Wetlands within Estero de San Antonio total 213 acres of brackish marsh, 13 acres of mudflat, 93 acres of open water, and 62 acres of riparian habitat. /59/

Both esteros are surrounded by private grazing lands and dairies limiting public access, and these two wetlands have remained relatively unchanged. The State of California claims title to the wetlands and tidelands. Encroachment into the estero watersheds by future urban expansion, upstream water diversions, and water quality degradation may threaten these wetlands.

Tomales Bay, a long intertidal finger of bayland formed along the San Andreas Fault rift zone, is 13 miles in length and fed by two creeks at its southeastern terminus. Spanish missions and rancheros first settled the Tomales area and established cattle ranches on the grassy hills surrounding the bay. American influx to California in the 1850s changed agricultural practices to farming potatoes and dairy ranches, much the same as in the Bodega area. The first harbor was built at Walker Creek and farm products were shipped by steamer to San Francisco Potato cultivation caused severe erosion of hillsides and the bay began to silt in. By 1870 the Walker Creek harbor was no longer navigable.

The bay developed as a center for the local fishing industry with shipment of fresh fish to San Francisco facilitated by the railroad. Oyster mariculture thrived in the bay tidal flats by 1907 after planting

of eastern and Japanese "seed" oysters. This industry continues to produce oysters from the 800 acres of tidelands alloted to this use.

Landings of herring and smelt continued to increase during the 1940s with the development of a herring canning industry in central California. Catch sizes have varied since the fifties due to market demands and great price fluctuations. As the San Francisco Bay area has grown more populous in the past twenty years Tomales Bay has become a popular recreation area. Tomales State Park encompasses a portion of the eastern shore and over half of the western shore is within Point Reyes National Seashore. The Department of Fish and Game manages an ecological reserve in the upper bay of 542 acres. Remaining areas are private and used principally as grazing lands. Several fishing and small craft harbors are situated at deep water locations along the shoreline.

The original acreage of tidal flats and salt marsh in the bay is not known. Sediment has been accreting at the mouth of the two tributary streams and salt marsh plants colonize these deltas. Scattered wetlands also line the eastern shoreline for a total of 405 acres of salt marsh. Few of these marshes have been filled; some were isolated by the railroad berm in 1875 and remain as pocket marshes. Mudflats are much more extensive, comprising over 1,500 acres. When exposed at extremely low tides these flats are invaded both by feeding shorebirds and humans collecting clams. /17/ Eel grass beds grow in the bay's subtidal zone and provide spawning habitat to the herring.

Continuing sedimentation due to development in the watersheds tributary to the bay, shoreline recreational development and water diversions all threaten the health of the bay and its wetlands.

The Point Reyes peninsula and seashore contains a number of small ponds and moderate size esteros. These include Abbott's Lagoon (170 acres), D-Ranch (25 acres), Drake's and Linantour Esteros (2,070 acres), and a series of lakes: Wildcat, Ocean, Crystal, Pelican and Bass (68

acres combined). /140/ These water bodies are both tidal, in the case of Drake's and Limantour Esteros, and freshwater, as with the lakes, and have a variable acreage of wetlands. They are all included within the Point Reyes National Seashore and are managed by the National Park Service. These wetlands are generally open for hiking and non-consumptive recreation. An oyster farm operates in Drake's Estero. The Natural Resources Management Plan for the National Seashore designates these areas in special protection management zones. /37,77/

Similar to Bodega Bay, Bolinas Lagoon is situated on the southern face of the San Andreas Fault zone and was once a deepwater embayment. The early development of the Bolinas ridge area involved extensive timber harvesting, potato cultivation and grazing in the watershed. Subsequent erosion silted in the lagoon and during the early 1900s only small craft could navigate the shallow channels. Recently high sedimentation rates have occurred sporadically through the 1970s. /64/

The 1,400-acre lagoon is triangular in shape and contains over 700 acres of mudflat and 150 acres of salt marsh. Eelgrass beds lie in the subtidal zone. The original acreage of wetlands in the lagoon is not documented. Despite its proximity to San Francisco, the Bolinas shoreline has not undergone great urban or recreational development. Subdivisions line the western sand spit but the majority of the shoreline is in public ownership. The Audubon Society maintains Audubon Canyon Ranch, the site of a large great blue heron and great egret rookery. The ranch functions to preserve the rookery and adjacent mudflats, and foster conservation education. /64/

A quarantine over clam taking and water sports was instituted in 1970 as a result of high coliform levels in the lagoon from local sewage discharges. This quarantine is still in effect and water quality improvement plans for neighboring towns are progressing. Continued sedimentation of the lagoon from surrounding developments could smother eelgrass beds and tidal flats.

Rodeo Lagoon is a 38-acre brackish water body at the southern tip of the Marin headlands, close to the Golden Gate. The lagoon, contained within the Golden Gate National Recreation Area, is under a special protection management zone. /140,77/

The wetlands of Sonoma and Marin Counties have been more heavily impacted by sedimentation than filling for development. Many wetlands along the Marin coastline are in partial or total public ownership and represent a recreational resource to nearby population centers.

San Francisco, San Mateo, Santa Cruz and Monterey Counties

The wetlands which formerly existed along the oceanfront of San Francisco have been filled and urbanized. San Mateo, Santa Cruz and Monterey Couties contain many small creeks with tidal influence in their lower reaches and riparian vegetation. Several larger river and slough systems are located on this section of coastline. Along the San Mateo coast south of Half Moon Bay are nine lagoons and ponds which contain some wetlands vegetation. Although the historic condition of these wetlands and recent changes are not documented. This coastline is not greatly developed and agricultural lands surround many marshes. Beginning in the north these wetlands and total acreages are: Pillar Marsh (30 acres), Tunitas Creek Lagoon (11 acres), San Gregorio Creek Lagoon (6 acres), Pomponio Creek Lagoon (1 acre), Pescadero Marsh (520 acres), Lake Lucerne (80 acres), Gazos Creek Lagoon (2 acres), Cascade Creek Lagoon (9 acres) and Green Oaks Creek Lagoon (31 acres). Of those areas of large acreage, several contain small wetlands. These include Lake Lucerne with 1 acre of freshwater marsh, and Green Oaks Lagoon which has 10 acres. /40,20/

Pescadero Marsh is the most significant wetland and of major importance to migratory birds as a stop-over between Bolinas Lagoon and Elkhorn Slough. Most of this wetland is fresh and brackish marsh (465 acres) and some areas of historic marshland were converted to agricultural use in the early 1900s. Pescadero Creek was once much deeper

where it traverses the marshland. The construction of the shoreline highway at the creek mouth and siltation from logging and agriculture in the drainage account for the creek's present relative shallowness. /14/ Both San Mateo County and the California Department of Parks and Recreation own portions of the marsh and the adjacent beach and dunes. Further agricultural expansion is unlikely and watershed erosion has greatly decreased from historic levels.

Santa Cruz County has many small creek mouth marshes surrounded by agricultural land in its northern region, a series of coastal lagoons in the City of Santa Cruz and a larger river system in its southern region. They are listed below with acreages of wetlands: Wadell Creek (11 acres), Scott Creek (30 acres), Wilder Creek (18 acres), Baldwin Creek (3 acres), Terrace Point Pond (1 acre), Antonelli's Pond (2 acres), San Lorenzo River (2 acres), Wood's Lagoon (6 acres), Schwann's Lake (4 acres), Corcoran Lagoon (6 acres), Moran Lake (2 acres), Soquel Creek (1 acre), Aptos Creek (1 acre). /20/

Urban development has displaced wetlands surrounding several of these lagoons and estuaries. Aptos and Soquel Creeks are examples. The Santa Cruz Yacht Harbor replaced tidal areas in Wood's Lagoon. A flood control project on the San Lorenzo River created levees along either bank and recontoured the channel diminishing any tidal influence to flood plain lands and securing shoreline developments. The San Lorenzo does remain a major spawning stream for steelhead and salmon and riparian woodlands border its upper reaches.

The Pajaro River, boundary between Santa Cruz and Monterey Counties, has been leveed and its wetlands reclaimed for agricultural use. This river once meandered over the Pajaro Valley; remnants of sloughs still dot the floodplain. One of these, Watsonville Slough, is tidal and contains nearly 40 acres of salt marsh. It lies adjacent to Pajaro dunes, a recreational housing complex and agricultural lands. Another tributary, McClusky Slough, is in Monterey County and consists of several separate lagoons totalling 250 acres. /20/

Monterey County contains one large wetland area, Elkhorn Slough, and many small remnant lakes and river estuaries. Elkhorn Slough was once a freshwater lagoon connected to the Salinas River until 1908 when the river changed course during a large flood. The slough and its tributary sloughs, Moro Cojo and Tembladero, isolated from the river but still open to the ocean, became estuaries. The former river mouth was kept open by tidal currents.

A wharf was built near the ocean outlet of the slough at Moss Landing in 1865. The wharf was a center for the whaling industry which operated from 1852 until 1888 in Monterey Bay. The Port of Watsonville, built in the upper area of the long linear slough, berthed steamers which transported grain from the Pajaro Valley farms to Moss Landing. The port was abandoned after the railroad reached this area in 1874. The railroad berm crosses the upper slough and runs along its eastern edge and its construction necessitated large amounts of fill on the wetlands. /7/

Near to Moss Landing, the wetlands were diked off for salt evaporator ponds during the early 1900s. Oyster farming developed in certain areas of the slough during the 1920s and 1930s. /7/

Agricultural reclamation of wetlands occurred to some degree along Elkhorn Slough and to a much greater extent on the Moro Cojo and Tembladero Sloughs. The upper fingers of brackish and freshwater marsh along tributary streams were particularly prone to diking. Many diked areas retain some wetland character or have become seasonal or permanent freshwater ponds (Stowe Pond). /19/

The greatest changes to the slough came with the construction of Moss Landing Harbor in 1946 to accommodate fishery production which accompanied the great sardine catches of the 1930s. By 1952, 30 to 40 fishing vessels berthed in the harbor and, eight canneries developed in the vicinity. With the harbor construction the ocean outlet of the slough was stabilized and the old Salinas River mouth gradually silted in. Tidal exchange into the slough, though, greatly improved.

Industrial development along the slough mouth began after WW II with the Kaiser refractory in 1946, P.G. & E. electric generating plant in the 1950s.

Elkhorn Slough encompasses 25,000 acres, of which 770 acres are tidal salt marsh, 670 acres are diked marsh, 420 acres are mudflat and 190 acres are salt ponds. Although original marsh acreages are not well documented, approximately half of the tideland was reclaimed for agricultural land. /19/ Formerly eelgrass beds lined the lower slough channel; these were removed with the dredging of Moss Landing Harbor. /7/ Moro Cojo Sough consists of 150 acres of water and marshland and Tembladero Slough, only 10 acres. The old Salinas River Slough, now essentially a brackish lagoon, covers 50 acres and is bordered by salt marsh. /140,19/

Over 1,000 acres of Elkhorn Slough have been designated as a National Estuarine Sanctuary. Their management is the responsibility of the California Department of Fish and Game. The department also manages a 73-acre wildlife area on Moro Cojo Slough. The Moss Landing Harbor District has title to the submerged lands of the slough. Other shoreline and marsh areas are privately owned as is most of the 226-square mile watershed of Elkhorn Slough.

A management plan for the estuarine sanctuary is presently under consideration and the area should open to public use within a few years. The Nature Conservancy, a private conservation group, formerly owned portions of the sanctuary and conducted tours. University of California Santa Cruz ran an environmental education program for several years in the Conservancy's preserve. Moss Landing Marine Laboratory and other research institutions and individuals have studied the slough and its resources for many years.

Moss Landing continues to be the primary fishing harbor of Monterey Bay. Their expansion in the 1970s supplied additional berths for commercial and sport demand.

Major threats to the slough arise from siltation due to development and agriculture in the watershed and water quality problems resulting from sewage discharge and septic tank failures and agricultural runoff. High coliform levels have restricted shellfish harvest in the slough since 1969. Sewage treatment facilities now handling local wastewater have reduced sewage discharge into tributaries. /19/

The Salinas River valley once held a series of freshwater lakes and swamps bordering the river channel. Tules and riparian vegetation lined these lakes much the same as the river's floodplain, and winter rains filled the shallow basins. Beginning with Spanish settlement and continuing into the American era these lakes were drained and diked for agricultural lands. A mile long reclamation ditch drained the lakebeds into the ocean; the town of Salinas covers a former swamp. A few remnants of these marshes remain. /39/

The remaining portion of the Monterey coastline contains small lagoons and river estuaries. Along the Monterey Peninsula are several lakes: Marina Ponds (5 acres), Robert's Lake and Laguna Grande (40 acres), Del Monte Lake (6 acres), and El Estero (15 acres). All are surrounded by urban developments and their water regimes are controlled. Many are city parks and contain fringes of wetland. /40,25/

The Carmel River contains an estuary of 40 acres with a 4-acre wetland. This river has recently lost much of its riparian vegetation due to a complex interaction of groundwater overdraft, upstream impoundments, and bank erosion.

The Little Sur and Big Sur Rivers have small areas of wetlands (7 acres and 4 acres respectively) and constitute the only significant wetland areas along the rocky, Big Sur coastline. Riparian vegetation lines most of the numerous and undeveloped creeks and rivers of this coast. Department of Fish and Game has proposed acquisition of lower reaches of the Little Sur River. /8/

In summary, a combination of urban development, harbor construction, agricultural reclamation, and sedimentation has reduced wetland acreages in this four-county region.

Overall the north and central coast has lost a lower percentage of its wetlands than the southern coastal region. Harbor development and agricultural reclamation are the primary factors inflicting wetland losses. Both these developments and silvicultural and agricultural activities in coastal watershed and bluffs reflect the resource-based economy of the region and its effects on wetlands. Urbanization has not been a major factor in wetland losses and for much of the coast, excluding the southern counties, continues not to be an influence. Certain central coast counties have grown in population during the past decade, particularly Santa Cruz (4.3% per year) and Monterey (1.6% per year) and San Mateo. /100/

The demand for recreational development along this scenic coastline expands concurrent with adjacent growth in the bay area and could increase demand for second homes, tourist and convention facilities, resorts, and recreational harbor expansion. Both the Russian River watershed, Bodega Bay, and Monterey have exhibited these trends to some degree. In contrast to consumptive recreational demand, passive recreational use of the coast has prompted a relatively new influence on preservation of wetlands as public lands. The Point Reyes, Bolinas, and Marine Headland areas exemplify these trends. These areas are heavily used by residents of the bay area urban centers. Sedimentation from watershed erosion continues to threaten the majority of these wetlands. The complex nature of this process makes the prediction of possible impacts to wetlands very difficult.

Wetland and riparian losses have had their largest effect on wildlife, reducing many species' populations to dangerous levels. Formerly, grey whales and sea otters inhabited the deep water bays and lagoons; tule elk foraged over marshlands in Point Reyes and Tomales Bay. The fall and spring spawning runs of salmon and steelhead in the northern rivers were famous. Sedimentation and loss of habitat in both riparian corridors and wetlands contributed to the decline of these species. Populations of waterfowl and shorebirds utilizing the Pacific Flyway must now concentrate on remaining estuarine areas and mudflats to feed and overwinter.

Wintering habitat is the greatest limiting factor to the numbers of waterfowl. Certain coastal wetlands are of prime winter importance to these bird species. /140/

Another waterfowl species, the Aleutian goose, is endangered and depends on coastal wetlands for wintering habitat. The use of coastal wetlands by all waterfowl species is listed in Table 5.

Five state and federal listed endangered species occur in north coastal wetland and riparian areas. California clapper rail, although concentrated in the bay area, occasionally visits Tomales and Bolinas Bays and inhabits Elkhorn Slough and Humboldt Bay. The endangered San Francisco garter snake prefers marshy and riparian areas on the San Mateo coastline. The Santa Cruz long-toed salamander occurs in a few isolated locations in Monterey and Santa Cruz Counties. Its population has declined with filling of seasonal ponds, its breeding habitat. The California yellow-billed cuckoo, which lives in thick riparian groves of the coast ranges is also endangered from loss of habitat. An endangered plant, salt marsh bird's beak (*Cordylanthus maritimus* spp. *palustrus*) grows in a few salt marsh locations. /16/

EVALUATION OF FACTORS

The economy of the north and central coast is largely based on logging, agriculture, fishing, and tourism. Wetlands play a direct and indirect role in the economy, and their losses can be attributed to specific land use practices.

The early settlement of the coast in the 1850s saw reclamation of wetlands primarily in Del Norte, Humboldt, Santa Cruz, and Monterey Counties. While the majority of these lands became pasture, ornamental lilies grow on certain parcels in the Smith River and products from these small acreages account for over 50% of that county's entire crop income. /144/ Grazing lands are less specialized and add to the total

TABLE 6

WATERFOWL USE OF NORTH & CENTRAL COAST WETLANDS

| Area | Average Annual Use Days | |
|---|---|---|
| | Waterfowl | Shorebirds, Waders, etc. |
| Lake Earl | 1.8 million | 1.235 million |
| Smith River | 170,000 | 132,000 |
| Humboldt Bay | 5.8 million | 7.673 million |
| Eel River | 1.4 million | 1.315 million |
| Stone Lagoon | 670,000 | 100,000 |
| Dry Lagoon | 166,000 | 90,000 |
| Freshwater Lagoon | 235,000 | 395,000 |
| Mad River Estuary | 15,000 | 22,000 |
| Mattole | 15,000 | 142,000 |
| Ten-mile River | Low waterfowl use | |
| Big River | Limited records but of importance | |
| Albion River | Limited records but of importance | |
| Garcia River | Limited records but of importance | |
| Gualala River | Low waterfowl use | |
| Bolinas Lagoon | 190,000 | |
| Tomales Bay | 640,000 | (November & December only) |
| Estero Americano | 40,000 | |
| Estero de San Antonio | 17,000 | |
| Bodega Harbor | 113,000 | (November & December only) |
| Limantour Estero | 220,000 | |
| Drake's Estero | 272,000 | |
| Abbott's Lagoon | 113,000 | |
| Pescadero Marsh | 70,000 | |
| Elkhorn Slough | 375,000 | 2.9 million |

SOURCE: U.S. Fish and Wildlife Service, Region 1. 1979. Concept plan for waterfowl wintering habitat preservation, California coast.

acreage of coastal pasture and thus the revenues of the cattle and dairy ranching industry. Production figures for dairies and cattle ranches over the entire coast are not reaily available and do not reflect wetland use particularly. However, the increased siltation of many wetlands in Sonoma, Monterey, and Marin Counties is attributable to agricultural practices and overgrazing in coastal watersheds.

The Pajaro and Salinas River floodplains produce several valuable crops including lettuce, strawberries, artichokes, and broccoli. Lettuce is Monterey County's number one cash crop and is primarily grown in these two areas; receipts for 1980 totalled nearly 202 million dollars. /100/ The 7,000 acre Arcata bottoms area of Humboldt County produces a variety of row crops with a yearly revenue of 1.1 million dollars. /144/

Timber harvesting and lumber production is the primary industry of Del Norte, Humboldt, and Mendocino counties. These counties rank fourth, second, and third in total board feet of timber harvested in California. /100/ Mills for timber processing and port facilities for state and overseas transport have caused wetland filling primarily in Humboldt Bay, but also to a lesser extent, Bodega Harbor, Bolinas Lagoon, Big River, and other areas of the Mendocino coast. The greatest effect of this industry though has been accelerated erosion of logged watersheds and sedimentation of downstream lagoons and estuaries. The majority of estuaries and river channels of these three counties have been affected to some degree by this process.

The fishing industry along the coast has been based largely upon relatively local fish resources and centered in numerous ports and harbors. Although harbor facilities are created in bay and lagoon formations along the coast, the extent to which commerical fish species require wetlands and estuaries for their life cycles varies greatly. For example, Pacific herring need eelgrass beds in which to spawn and

and are distributed in suitable estuaries throughout the coast. The role of estuaries and wetlands as suitable nursery habitat to juvenile salmon and steelhead is unclear, although a dependency is demonstrated by some research. Salmon and steelhead do, however, require streams with cold temperatures lined by riparian corridors and containing unsilted gravel beds. The juvenile dungeness crab, a major component of the commercial catch, mature in estuaries. /43,73/ The value of the commercial fishery varies annually. Humboldt Bay receives over half of the catch landed in northern California which in 1968-75 amounted to 3.7 to 6.6 million dollars annually. /118/ Processing and related industries account for additional revenues and employment. Existing harbor and canning facilities are adequate to service this industry. Sport fishing and party boats account for additional incomes to this region. Nearly every north coast harbor contains both commercial and sport fishing craft. Fishing from piers and jetties, as well as surf fishing, are popular but do not contribute greatly to the regional economy.

Oyster mariculture is a profitable enterprise located in several estuaries on the coast. One oyster farm in Humboldt Bay produces 875,000 lbs. of oyster meats yearly valued at 1.7 million dollars. /118/

Tourism and recreation produce large amounts of revenue to the coastal region. The scenic coastline with its many parks and campgrounds draws millions of visitors yearly. Tourism accounted for 18.2% of all personal income in Del Norte County, 9.1% in Humboldt County, and 12.5% in Mendocino County. Expenditures by tourists in Monterey County totalled 426 million dollars and 100 million dollars in Santa Cruz. /100/

Although estuaries, wetlands, and rivers are not primary attractions in themselves; combined with other amenities, they serve as an element of the beauty of the coast. The development of recreational and visitor services for tourists has not depleted wetlands in the region.

Residential developments have replaced wetlands in a few locations, such as Bodega Bay and Lake Earl during the past 10 to 15 years. Other residential projects have affected wetlands in the cities of Arcata, Eureka, Santa Cruz, Salinas, and Monterey. The majority of these projects were not wetland or water dependent and were completed prior to coastal development regulations.

Several technological factors have influenced wetland losses. Early coastal development relied upon water transportation for shipment of farm and wood products and harbors for the mooring of fishing vessels. Many wharves and harbors were built and dredged in tideland and marsh areas. The completion of the railroad in 1870 changed transportation patterns and made many harbors obsolete. They gradually fell into disrepair and marshes and tidelands reestablished. In addition, railroad construction disturbed and isolated wetland areas in several locales.

Changing agricultural and silvicultural practices have influenced sedimentation in coastal watersheds. Watersheds where agriculture is the primary land use are concentrated south of Mendocino County. Forested watersheds, although more common in the northern counties, also occur in San Mateo and Santa Cruz Counties. The original era of agricultural development included tilling of moderate to steep hillsides. This practice fostered accelerated sedimentation which has filled many coastal lagoons and wetlands by the end of the 1800s. Conversion to grazing and pastureland has lowered siltation rates in some areas particularly where land practices avoid overgrazing. /64/ Impoundment of upstream water, more common on the central coast, acts to temporarily retain sediment also.

Logging operations until the 1930s were based on water transportation of fallen timber to mills which were situated at the mouth of the logged watershed. Typically, rafts of logs, often held behind dams during the summer and fall, were released on freshets of water and stored in the tidal portions of rivers behind logging booms.

With the logs and flood water suspended sediments settled out along the river and estuaries. Ox teams and steam engines supplied the power to drag the large logs out of the forest either to shoreline trains or the river itself.

Modern techniques involve the use of tractors, skid trails or cable yarders, loading platforms and extensive road building. New techniques allow timber to be cut much faster than previously. Major storms in 1955 and 1964 followed extensive clear cutting in several watersheds; sedimentation rates were extreme. /50/

Physical factors influencing wetlands parallel technological advances. Lower water outflows due to upstream impoundments and diversions, sedimentation, and mining of gravel from certain river beds (e.g., Russian River) impact wetland and riparian habitats.

Social factors influencing the loss of wetlands are diverse and often unquantifiable. The north and central coast has always been a land of rural character and scattered habitation whose population exhibits a highly parochial and independent life style and attitude. A great majority of the residents of this area derive their livelihood from natural resources, the regulation of which they often oppose (e.g., Redwood National Park expansion).

While this general profile may emerge, a great many local people use the tidelands, waters, and marshes for hunting and fishing as well as non-appropriative uses such as bird watching, picnicking, nature study and other activities which do not remove resources from the environment. /70,118/ The non-urban features of the landscape and lack of numerous national and state wildlife refuges make a quantification of resource use difficult.

Although conservation organizations such as the Northcoast Environment Center, Sierra Club, and Audubon Society dot the coast, many of the specialized groups and large-membership organizations are headquartered in Santa Cruz, San Mateo, and northern Monterey Counties. These groups have been instrumental in preservation of several areas (e.g., Bolinas Lagoon, Elkhorn Slough).

Public concern over the filling and disposition of Humboldt Bay lead to the legislative authorization of the Humboldt Bay Harbor Recreation and Conservation District in 1973. Similar to the San Francisco Bay Conservation and Development Commission (BCDC), the district has permit authority over activities in the shoreline band around the bay. Their objectives include preservation of environmental quality and tideland acquisition as well as planned appropriate development. /150/ Similar concerns prompted the statewide passage of the coastal initiative in 1972 and initiation of the Coastal Commission and regulation of development in the coastal zone. However, the changes affecting many of the estuaries and wetlands on the north coast are not dramatic development projects but rather slow siltation and filling and do not often invoke rapid public response.

Recreational uses of the wetlands vary in different areas and visitor use figures are often not kept. However, recreational fishing and clamming are popular in many estuaries and waterfowl hunting is allowed in Humboldt Bay, Smith and Eel River deltas, Lake Earl, Pescadero Marsh, and several other places. Table 6 lists visitors to several of the coastal wetlands. Additionally, Elkhorn Slough and Lake Earl reserves will be opening in the next few years.

TABLE 7

VISITOR USE OF NORTH COASTAL ESTUARIES AND WETLANDS

Point Reyes National Seashore

| 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|
| 1,810,968 | 1,943,522 | 1,514,923 | 1,434,598 | 1,348,237 |

Humboldt Bay National Wildlife Refuge

| | Environmental Education | Bird Watching |
|---|---|---|
| 1981 | 360 visitor hours | 120 visitor hours |

Humboldt Bay

| | |
|---|---|
| 1957-1960 average | 27,144 angler days per year sport fishing |
| | 3,500 use days per year clamdigging |
| | 25,000 hunting days per year waterfowl hunting |

Smith River Delta-Lake Earl

| | |
|---|---|
| 1970-72 average | 3,093 hunter days per year waterfowl hunting |

Eel River Delta

| | |
|---|---|
| 1968-69 average | 3,985 hunter days per year waterfowl hunting |

Tomales Bay

| | |
|---|---|
| 1967 | 1,800 clamdiggers observed on a single day |

Bodega Bay

| | |
|---|---|
| 1970 | 10,000 visitors annually for educational purposes |

TABLE 7 (continued)

Elkhorn Slough

| | |
|---|---|
| 1970 | 170 hunter days per year for waterfowl hunting |
| | 5,200 visitor days per year environmental education and scientific research |

SOURCES: California Department of Fish and Game Coastal Wetland Report Series; Pt. Reyes Visitor Center; Greg Mensik, Manager, Humboldt Bay NWR; Madrone Associates, 1979 Preacquisition Planning Study for Elkhorn Slough.

## SAN FRANCISCO BAY

### HISTORY OF WETLANDS

#### Conditions and Changes

The San Francisco Bay is the largest estuarine and wetland area in the state. Fresh water from a 50,000 square mile watershed extending from the southern Cascades along the Sierra Nevada to the southern San Joaquin Valley flows into the bay. The large drainage area and grandeur of the bay itself confer on it world significance as a natural harbor and estuary. Figure 5 illustrates the various regions of the bay.

Prior to development, the bay surface to the outer edge of marshland covered 476 square miles. Marshland, including the large brackish Suisun Marsh on the northeastern periphery of the bay, added another 313 square miles. The bay and wetlands together comprised approximately 789 square miles. /18/

The present tidelands provide a good indication of historic conditions. Tidal marshes slope from the intertidal zone gradually upward changing in vegetative composition from just below the approximate mean tide level to the line of highest tidal access. Salt, brackish and, in certain areas, freshwater marshes are present. Intertidal salt marsh is monotonous in vegetative composition; cordgrass (*Spartina foliosa*) occupies the lowest bayfront zone, mingling with and then supplanted by pickleweed (*Salicornia pacifica*) at higher elevations. High and middle elevation salt marsh contains a greater mix of plant species, such as alkali heath (*Frankenia grandifolia*), salt grass (*Distichlis spicata*), sea lavender (*Limonium californicum*), marsh gumplant (*Grindelia stricta*), and jaumea (*Jaumea carnosa*). Brackish and managed marshes, found primarily in the northeastern portion of the bay and upper tidal portions of tributary creeks and rivers, support a greater variety of species, such as alkali bulrush (*Scirpus robustus*), Olney's bulrush (*Scirpus Olneyi*), tules (*Scirpus acutus*), common reed (*Phragmites*

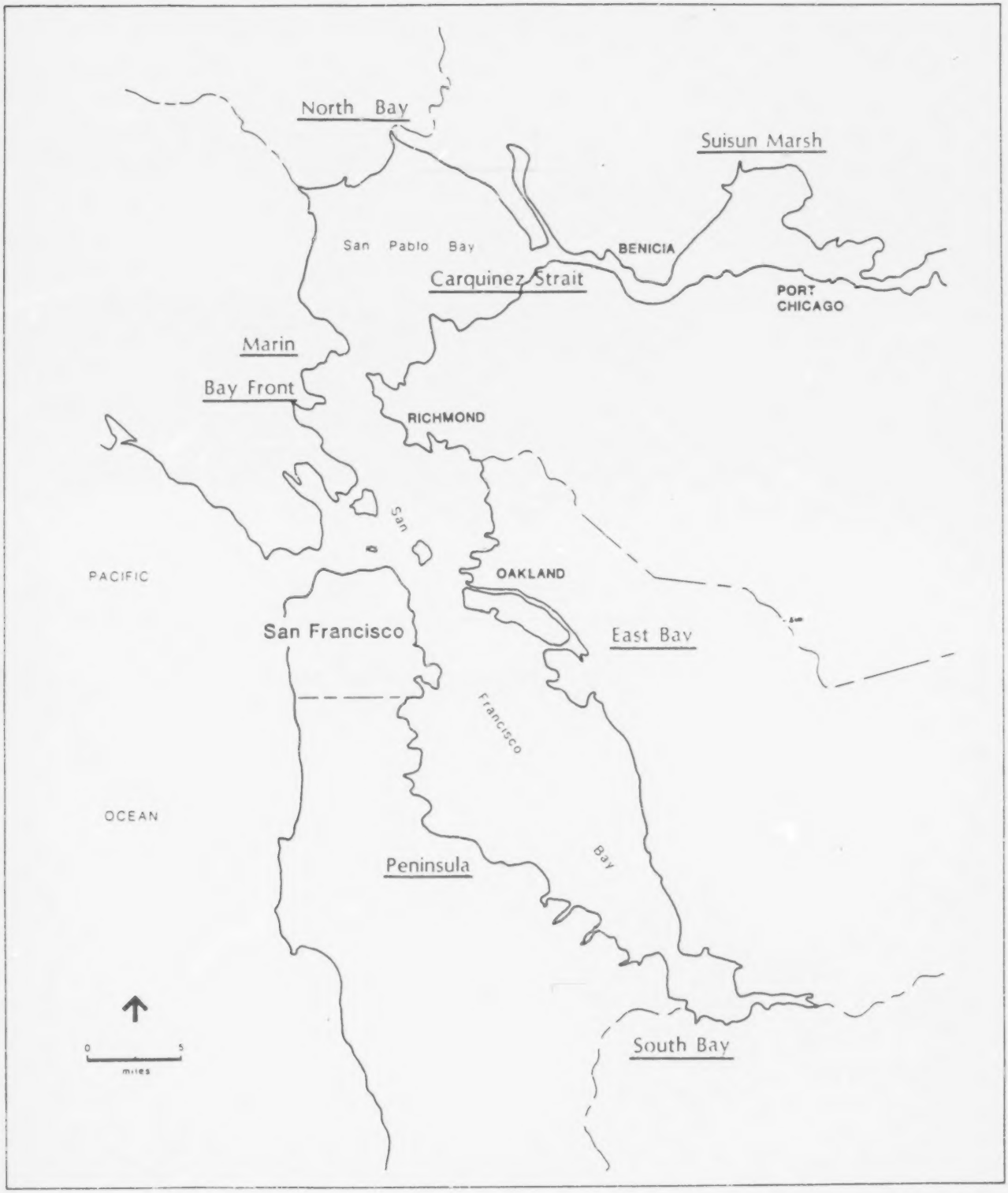



**FIGURE 5**

**San Francisco Bay Region**

ESA/MADRONE

*communis*), as well as brass buttons (*Cotula coronopifolia*), cattails (*Typha* sp.), and fat hen (*Atriplex patula*).

Freshwater marshes represent an important habitat for waterfowl complementary to open water of the bay. Common species include tules and bulrush (*Scirpus* sp.), cattails (*Typha* sp.), pondweed (*Potamogeton* sp.), and smartweeds (*Polygonum* sp.). /30/

The bayfront, even prior to early settlement in the 1800s, was not completely ringed by marshes but had large tracts of wetlands in certain areas. Beginning near the present site of the San Francisco Airport and extending southward the marshlands became a wide corridor, lining the peninsula, extending deep into the south bay drainages, and north as a wide corridor along the east bay into Richmond. The corridor ranged from a quarter of a mile in width to seven miles and greater. To the northwest, the mouths of creeks and coves of the Marin bayfront held delta-like wetlands, and brackish marshes extended several miles upstream from the mouth of the Petaluma and Napa Rivers. Northern San Pablo Bay received drainage from Petaluma, Sonoma, and Napa Rivers as well as the Sacramento-San Joaquin, and was lined with salt marsh. Suisun Bay in the northeastern portion of the bay, inland from Carquinez Strait, also held large tracts. Wetlands covered much of Richmond, and the San Francisco waterfront had several scattered areas of salt marsh. The three largest marsh areas were the Napa, Suisun, and Alviso (south bay) marshes.

Earliest settlement of the bay area began in the late 1700s with the founding of Spanish missions, forts, and rancheros. Most farms were inland from the bayfront, and San Francisco was little more than a village on Yerba Buena cove. The large fringes of tidelands along the east and south bay at first precluded their choice as harbor locations the less vegetated, more abrupt shoreline of San Francisco was used instead. /55/

Following the Gold Rush of 1849, American settlement of the bay ballooned. The bay is a natural harbor and became a major shipping center for both California products and imports from the Pacific. The railroad reached the bay area in 1869, further stimulating shipping of products from the interior western region. San Francisco's waterfront and interior city rapidly expanded. American squatters confiscated the rancheros of Oakland, Berkeley, and the east bay. Major bayfront towns expanded around natural harbors, landings, and railroad facilities such as at Benicia, Antioch, Redwood City, Port Costa, Port Chicago, Vallejo, and Sausalito. By 1898, Oakland had expanded its port facilities along the San Antonio Slough and held over 20 miles of bay frontage. Towns along the Carquinez Straits were industrial, food processing, and shipping centers for central valley and Pacific products. Redwood City was the departure point for much of the redwood timber cut from the Santa Cruz Mountains.

Between 1850 and 1930, the first era of bay development saw a major loss of wetlands for port and military facilities and diking of marshes for agriculture along the northern San Pablo and Marin bayfront, southeastern (San Lorenzo and Fremont), and south (Milpitas, Alviso, and Sunnyvale) bayfronts. /18, 55/ Diking of tidelands for salt evaporator ponds in the south bay, peninsula, and Napa River areas began in 1860. This activity had a major impact on transforming tidal wetlands into diked wetlands. The exact acreage of marshes diked and/or filled during this era is unknown, but this period sustained the greatest losses.

Another activity quite distant from the bay had a profound effect during this era. Hydraulic mining of the Sierra Nevada for gold released massive amounts of sediment into the Sierra rivers which was eventually deposited in the bay and, in part, carried out to sea. Shoaling was particularly evident in the San Pablo and Suisun Bays, and sediments have continued to be redistributed in the north bay in recent times. Early estimates completed after 41 years of Sierra mining indicated deposition of 3.3 feet on shoals of Suisun Bay and 2.5 feet in

San Pablo Bay. /38/ An estimated 79 square miles of tidelands were built up through this process, making many areas of the bay shallow and difficult to navigate. /27/

A second era of growth and change came to the bay area with the second World War and establishment of military reservations. Thirteen of the twenty-five military establishments in the nine-county region cover tide or wetland areas to some extent, and many are oriented toward water transport. These include: Oakland Naval Supply Center, Alameda Naval Supply Center, Alameda Naval Weapons Center (filled 1,000 acres), Pt. Molate Naval Supply Center, Concord Naval Weapons Center, Treasure Island Naval Station, Mare Island Naval Shipyard, Ft. Mason, Hunters Point Naval Shipyard, Government Island Coast Guard Base, Moffett Naval Air Station, and Hamilton Air Force Base. /91/

After the war, bay area population increased rapidly, inducing extensive construction of housing tracts, associated flood control projects, industrial and commercial centers, and highways. By 1967, 4.5 million people inhabited the bay area, an increase of 3 million in 35 years. Housing tracts and commercial buildings rapidly replaced many small farming communities and formerly vacant agricultural lands. San Francisco, Oakland/Berkeley, San Jose and Santa Clara Valley, and the Antioch/Benicia waterfront developed into industrial and commercial centers, with surrounding regions acting as commuter housing communities. Along with this rapid increase in population came great increases in municipal waste and sewage, which was either dumped or discharged directly into the bay until 1945. The year 1950 saw the worst pollution of bay waters. Since that time treatment has been upgraded and plants have consolidated discharges; water quality has vastly improved.

Several large housing developments during the 1960s and 1970s filled tidal wetlands or diked former tidelands. These included Foster City, Redwood Shores development (4,200 acres), Bay Farm Island and Harbor Bay Isle, Anza development in Burlingame, and Bel Marin Keys and Bahia Vista in Marin County, as well as others.

Population in the nine-county bay region increased by .9% annually between 1970 and 1979. /4/ Housing and employment centers for this increase in inhabitants are now distributed over a wide geographic area. Information on the specific acreage losses of this increase on the filling and development of wetlands is not available.

Although many marinas and ports were established in the early years of the bay development, all have required maintenance dredging and periodic expansion and renovation. Dredge spoils were formerly disposed of on marshlands or used to fill bay lands for development. With increasing regulatory restrictions, land disposal sites have become less available or at least problematic as disposal sites. Dredge materials are now typically disposed of in deeper reaches of the bay. The Port of Oakland filled 140 acres for their Seventh Street Terminal, and in 1967 the Port of San Francisco created their Army Street Terminal of 68 acres. Industrial wharves constructed at Richmond and along the Carquinez Straits serve the petroleum and chemical industries. /91/

The two major and other smaller airports overlie tidelands largely because of their need for flat topography and unimpeded access to the shoreline. San Francisco airport filled approximately 4,000 acres and Oakland 1,500 acres. Municipal landfills account for some wetland loss: 38% of bay area landfills are on tide and marshland, but the rate of filling is declining. Power plants and energy facilities are also located along the shoreline. Six Pacific Gas and Electric power plants collectively cover 650 acres of former wetlands. /91/

The regulation of bay filling by the San Francisco Bay Conservation and Development Commission began in 1965. These regulations, legislated by the McAteer-Petris Act, slowed filling considerably, as evidenced by the following breakdown: the bay saw an average loss of wetlands and tidelands of about 1,500 acres/year between 1850 and 1940; 2,300 acres/year between 1940 and 1965, 94 acres/year between 1965 and 1969, and 29 acres in 1970. /92/ Data are not available for 1970 to 1982; however, the greater regulation of fill operations by the Corps has had a profound influence on the figures.

Federal, state, and local governments acquired some of the remaining wetland and tideland areas as parks and wildlife areas. These include San Francisco Bay National Wildlife Refuge (16,000 acres, currently authorized for 22,947 acres), San Pablo National Wildlife Refuge (11,700 acres), Grizzly Island State Wildlife Area, various other state wildlife areas (14,250 acres), China Camp State Park, Benicia State Recreation Area, Palo Alto Baylands Park, Mountain View Shoreline Park, Coyote Hills Regional Park, and many other small areas. /95/

Several marsh restoration projects have returned diked lands to tidal action and increased year-round habitat area. These include the Faber Tract in Palo Alto, portions of Alameda Creek flood control project, Muzzi Marsh in Marin County, Hayward Shoreline Area Marsh, and other small mitigation projects on baylands.

Present and Future Conditions

The tidal wetlands of San Francisco, San Pablo, and Suisun Bays have been reduced by 188 square miles, a 60% loss from original acreages; only 125 square miles remain. /78/ This final figure includes those marshes created from the 79 square miles of accreted sediments, and areas of managed marshland. /205/ If only the original tidal marshes are taken into account, of which 59 square miles remain, the bay has experienced a 75% net loss of original wetland acreages. The remaining tidal marshes are along the Napa and Petaluma Rivers, southern San Francisco/San Mateo Peninsula and the south bay, north Richmond, Gallinas and San Rafael Creeks, and Suisun Bay. Suisun Marsh has both managed and tidal wetlands totalling 57,000 acres, with an additional 27,000 acres of bays and waterways. The Suisun Marsh is the largest remaining area of contiguous wetland in the state, representing 10% of the total state acreage. /93/ Although private duck clubs have decreased in acreage around the bay since 1950, Suisun Marsh still holds approximately half of the remaining managed wetlands with 216 clubs. /91/

A large percentage of former tidal wetlands are now salt evaporator ponds (63 square miles) with 28,000 acres in the south bay and 9,000 acres in Napa. /193b/ These ponds demonstrate a specialized "wetland" character. Other diked areas, despite their nontidal condition, retain many wetland characters. /60/ Of these 52,000 acres of diked former tidelands, 62% are in agricultural use, growing hay and forage crops. /95/ Their low elevation (in San Pablo Bay average elevation is three to five feet below mean sea level) permits ponding to occur during winter months unless regularly pumped dry. Where pumping is negligent or irratic, seasonal wetland habitat for water-associated bird species develops, even though cultivation has eliminated typical wetland plants. These agricultural lands cover 32,000 acres mostly in northern San Pablo Bay. /95/ The remaining 20,000 acres of diked historic wetlands are unevenly distributed around the bay, wherever plans to fill after diking were not carried out or the land has retained its agricultural use. Typically they are open, undeveloped lands partially covered by marsh plant species such as pickleweed.

The diked historic wetlands and their characters were described in a recent report:

> ...the diked historic baylands are unique because of their relationship to the bay and regional importance to the bay area. In most cases significant wetland values coexist with agricultural activities. If existing agricultural uses stopped most of the lands would quickly revert to year-round wetlands. Except for saltponds they are the last large area in the state that could be opened to tidal action, protected for existing natural values, or enhanced to increase lost and scarce habitat. Moreover, lying adjacent to a rapidly growing, heavily urbanized area, they are also threatened with changes that will significantly reduce or destroy both their present and potential habitat values. Wildlife does not respect political boundaries and uses both the bay and the diked historic baylands, which were formerly part of the bay. Many of the baylands provide spreading basins for runoff during wet weather, thereby reducing the need for expansive levee reconstruction that will be needed if baylands are developed. Many also have soil characteristics that will make construction expensive and urban uses risky. /95/

The most significant effects of wetland losses have been to fish and wildlife. Prior to 1850, grey whales and sea otters inhabited the bay, and migratory waterfowl were present in vast numbers. Both tule elk and bear, as well as other terrestrial mammals once frequented marshlands. The tidal flats had a fauna of native benthic organisms which have largely been supplanted by introduced species. Three species—salt marsh harvest mouse, California clapper rail, and the black rail—specifically adopted to salt or brackish marshes, are now rare or endangered due to habitat loss. Two plant species are listed as endangered: salt marsh bird's beak (*Cordylanthus maritimus* spp. *palustris*) and mudflat quill plant (*Lilaeopis masonii*). Fish, salmon, sturgeon, flounder and smelt, and benthic animals such as shrimp, clam, and oysters were intensively harvested from 1850 to 1900. In 1869, the oyster industry thrived in San Leandro Bay next to Oakland. These commercial fisheries declined rapidly after 1900 due in part to loss of intertidal and wetland habitats. Over-fishing, upstream diversions, and water pollution were major contributing factors. There is no longer a crab, clam, mussel, or oyster commercial fishery in the bay. /18/

Waterfowl and shorebirds continue to use the bay as a major wintering grounds along the Pacific Flyway. In 1964, over 500,000 waterfowl were counted on the bay for the month of December. Average annual waterfowl use-day figures for San Francisco wetlands total:

| | |
|---|---|
| South San Francisco Bay* | 8.4 million |
| Corte Madera Marsh* | 1.6 million |
| Napa Marshes | 1.4 million |
| San Rafael Marsh* | 1.3 million |
| North Richmond Marsh* | 300,000 |
| Petaluma Marsh | 65,000 (November and December only) |

*Includes adjacent open bay water /138/

Two thirds of all waterfowl recorded along the coast in winter inventories are on San Francisco Bay. /138/ In addition, between 10% to 25% of the Central Valley's waterfowl populations use Suisun Marsh,

averaging 500,000 to 700,000 birds. The marsh sometimes serves as a reliever site for wintering waterfowl of the valley when the rainy season is late and interior wetlands are still dry. /137/ Migratory shorebirds and other water-related birds feed on benthic animals of bay mudflats. This habitat continues to be the most important feeding area on coastal California for millions of migratory shorebirds. /18/ These tidal flats are largely the result of accreted sediments swept down from the Sierras.

Current pressures on bay tidal and nontidal wetlands are of several types: fill and development for urban uses, dredging for new marinas and port expansions, both point and non-point source pollution problems, and continuing threat of salinity increases in Suisun Bay due to major diversions of freshwater inflows from the Sacramento and San Joaquin Rivers.

Population projections for the next decade indicate an increase from 1975 population of 4.87 million to 6.2 million by the year 2000. This represents a growth rate of 1% a year, a slight increase over the .9% per year increase experienced from 1970 to 1979. Households or housing units are predicted to increase 1.9% per year; fewer persons will occupy each household than in previous decades, although housing areas will be more compact. This population and housing increase is expected to be borne largely by Santa Clara, Contra Costa, and Alameda Counties. These counties all have significant bay frontage containing diked and tidal wetlands. Sonoma and Solano Counties are also predicted to increase greatly in population. /4/ A 1979 review of local general plans and zoning ordinances in the bay area indicated 23 square miles of diked historic marshland slated for urban development. /18/

Dredging of existing port facilities and expansion also threatens tidal and nontidal wetlands. Waterborne dry cargo in the bay area is expected to double by 2000. Forecasts indicate containerized cargo shipping will increase by four times. Liquid cargo such as petroleum may double. To accommodate forecasted increases in dry cargo and petroleum shipments, new terminal facilities will be needed. If all

port facilities needed to accommodate projected increase were developed, nearly 1,000 acres of new terminals would be created and over 300 acres of potential bay fill would be required. /94/ This long-term development forecast does not include a supertanker port.

The San Francisco Bay area currently has 183 small boat marinas. /22/ Market studies indicate a demand for additional facilities of up to 3,500 slips. /44,51/

Water quality in the bay is the most complex influence on wetlands, even though it has greatly improved in the past thirty years as new sewage treatment facilities have been built. However, the expanding urbanization of watersheds around the bay has aggravated non-point pollution problems. Urban runoff typically contains a number of heavy metals, nutrients, and chemicals which can have deleterious effects on the bay water quality. Most runoff courses down creeks and flood control channels into the bay or wetlands. Association of Bay Area Governments (ABAG) will create a 50-acre marsh in Fremont in order to monitor the effectiveness of wetlands in sediment catchment and treatment of urban stormwater runoff. A similar demonstration project in Palo Alto marshes has proved effective. /24/

Salinity in Suisun Marsh has been increasing along with increasing water diversions by the state and federal water projects in the Central Valley and Sierras. One result has been a decline in certain high food value plant species which are favored by brackish-to-fresh soil water conditions. These brackish plant species are particularly important to ducks and geese wintering in Suisun Marsh. /93/ In 1971, Water Rights Decision 1379 established water quality criteria for Delta outflow and Suisun Marsh, particularly for salinity. These criteria were included in the 1975 San Francisco and Central Valley Water Quality Basin Plans (Regional Water Quality Control Boards). Revised standards adopted in 1976 under the basin plans became the basis for terms and conditions for operation of the State Water Project and federal Central Valley Project

in Decision 1485. Decision 1485 standards and criteria are far more complex than their predecessors, taking into account the differing water quality requirements of water-year types and types of beneficial uses. Notwithstanding projected water diversions out of the Delta, future Delta outflow will be required to meet these standards. /23/

EVALUATION OF FACTORS

The San Francisco Bay began as a maritime center with is port facilities serving much of the state and Pacific. Wetlands, diked off and used as agricultural land, provided hay for horses in the cities and outlying dairies. The early economy of the region largely revolved around the bay and shipping and a once healthy fishing industry. Now the maritime industries have dimmed somewhat in importance and the agricultural economy is largely gone. The region's economy is diversified and no longer as reliant on water transportation or other shoreline activities. The many wetlands and diked lands have been largely converted to residential, commercial, and industrial uses. Few of these uses specifically required this type of land, although certain activities are dependent upon proximity to water.

Prior to the 1950s, little construction on tidal or diked bayfront lands occurred due to the great cost of fill, even though the land was considered cheap. When large development corporations entered the home-building market, they were able to absorb the large capital investments. /55/ Several of the large bayfront tracts also incorporated individual boat docks, adding amenities for the average home. Although the value of land and homes throughout the bay area has increased dramatically in the last decade, there is no information indicating that bayshore homes, as a whole, are worth more than similar homes located elsewhere. Excepting for specific water-related industries and facilities, this trend also holds true for commerical and industrial developments. Table 7 compares population growth in the bay area counties for a number of years. The massive immigration and birthrate has created a great demand for housing and other development spurring the development of wetlands.

TABLE 8

POPULATION TRENDS OF SAN FRANCISCO BAY AREA

| COUNTY | April 1, 1950 | April 1, 1960 | April 1, 1970 | April 1, 1980 | Average Annual Growth Rate 1979 - 80 |
|---|---|---|---|---|---|
| Alameda | 740,315 | 908.209 | 1,071,446 | 1,105,379 | 0.3% |
| Contra Costa | 298,984 | 409,030 | 556,116 | 657,252 | 1.7 |
| Marin | 85,619 | 146,820 | 208,652 | 222,952 | 0.7 |
| Napa | 46,603 | 65,890 | 79,140 | 99,199 | 2.3 |
| San Francisco | 775,357 | 740,316 | 715,674 | 678,974 | -0.5 |
| San Mateo | 235,659 | 444,387 | 557,361 | 588,164 | 0.5 |
| Santa Clara | 290,547 | 642,315 | 1,065,313 | 1,295,071 | 2.0 |
| Solano | 104,833 | 134,597 | 171,989 | 235,203 | 3.2 |
| Sonoma | 103,405 | 147,375 | 204,885 | 299,827 | 3.9 |
| San Francisco Bay Area Counties | 2,681,322 | 3,638,939 | 4,630,576 | 5,182,021 | 1.1 |
| California | 10,586,223 | 15,717,204 | 19,971,069 | 23,668,562 | 1.7 |

SOURCE: Bureau of the Census, U.S. Department of Commerce

Airports, port and marina facilities, and military installations require either flat, open land, access to water or relatively isolated locations, and their function is tied to shoreline support areas. These installations create jobs or provide needed services. For example, in 1965 the shipping industry provided 50,000 jobs and continues to employ nearly this number of people. /55/ The Port of San Francisco annually handles $800 million of cargo. /55/ Secondarily, other forms of transportation are directly linked to port activities. The tonnage of cargo handled by the six major bay ports (San Francisco, Oakland, Encinal, Benicia, Richmond, and Redwood City) is expected to triple by 2020 with additional increases in port facilities. /94/ The Port of San Francisco is currently renovating and expanding their facilities and obtaining equipment for "containerized" cargos. The principal commodities handled by the ports include motor vehicles, raw cotton, fruit and vegetable juice, iron and steel products, and crude oil and petroleum. /100/ Industries requiring wharves and shoreline facilities such as petroleum refinement, chemical, and paper industries also create jobs and revenues.

The two major airports employ 35,000 people and San Francisco International handled 24.4 million air passengers in 1979. However, air cargo and travel has declined in recent years and regional airport expansion plans are still uncertain.

Recreational marinas are much in demand as the number of boat owners increases and new berths do not. Although these marinas do not employ many people, they do return revenues to local governments.

Perhaps one of the greatest and uncalculated economic factors affecting the bay is its value to the tourism industries. San Francisco's waterfront and the bay shoreline is visited by millions each year as well as attracting residents from various parts of the region. The natural beauty of the bayfront is a major amenity, attractive to visitors.

Agricultural use of wetland areas is still a viable industry with farms in northern San Pablo Bay producing hay for nearby dairies

in Marin and Sonoma Counties, which are otherwise subject to high transportation costs for feed from other parts of California. However, the lower land value of these agricultural lands in comparison to their value as housing sites is such that there is a strong incentive to develop them. This trend also holds true for diked wetlands which could serve as lower value flood control lands or for other purposes.

The cost of maintenance, the increased value of lands for development, and encroaching urbanization has led to the elimination of some duck clubs in the south bay. Even the high membership costs of clubs in Suisun Marsh, a fully protected area, do not meet the costs of operation. These problems are discussed in more detail in the Central Valley section.

The commercial production of salt, begun in the bay in the 1870s, continues to be a viable, if not very profitable, industry. Leslie Salt Company has not expanded its facilities in many years and sold 4,200 acres of nonoperative ponds at Redwood Shore in 1971. Some of these ponds were filled and developed as a residential community. Additional inactive ponds on Bair Island are proposed for similar development. The company has not forecast a date for closure of other ponds. /193b/

Technology of several types has allowed for greater filling in the bay by reducing the known engineering problems on construction of bay fill. Advancements in engineering of fill, management of bay mud, construction and maintenance of levees, foundation engineering, pile driving, dewatering, etc., have resolved subsidence, spreading, and other problems of filled lands and pier construction. Dredging is now accomplished by hydraulic equipment and can be done with greater efficiency. The construction of the major bridges crossing the bay afforded easier access to most areas in the bay and led to their subsequent development. BART has had a similar though lesser effect.

Physical factors affecting wetlands are of two principal types: sedimentation, and upstream water diversions and impoundments. The great amounts of sediment deposited in the bay in the 1800s transformed the estuary permanently, both biologically and as a navigable water body.

Continued movement of this older sediment and continued deposition resultant from the great and varied land uses in the 50,000 square mile watershed of the bay have had an effect which is only partially documented. Water diversion and impoundments have reduced Delta outflows to 50% of historic levels. /91/ The biological effects of new water quality balances on wetland and mudflat productivity and species composition are largely unknown. With the ever-increasing demand for water in other parts of the state, future Delta outflows could be further reduced.

Social attitudes towards wetlands and the San Francisco Bay may be measured many ways—visitor use of shoreline parks and refuges, and membership in conservation groups. The overriding and visible presence of the bay to all its regions' residents inspires an awareness of the estuary and in many a deep concern for its welfare. This public concern for the quality of the bay and disposition of its shoreline prompted the passage of the McAteer-Petris Act and formation of the Bay Conservation and Development Commission by the state legislature in the mid-1960s. This commission was charged with regulating the bay shoreline and the overriding emphasis of its creation was to stop the filling of the bay.

Instrumental to the movement which brought about the creation of BCDC was the Save the Bay Association, a membership group of 20,000 formed in 1967. Their membership has remained at this number since its founding./203b/ Other bay organizations particularly involved in wetlands conservation include the Audubon Society (three regional chapters with 10,336 members), the Sierra Club, Friends of the Earth, the Wetlands Coalition, the Marin Conservation League, People for Open Space, Friends of Redwood City (concerned with development at Redwood Shores), and others.

The many local parks surrounding the shoreline and encompassing wetland areas, shoreline trails, and public fishing piers are all reflections of social interest in the San Francisco bayfront. An example

is the Palo Alto Baylands Center, which conducts educational programs and has a boardwalk trail over their tidelands. The Interpretive Center has an average annual attendance of 34,000 to 35,000 adults and children. A study of recreation on the diked wetlands of the bay found 100,000 people/year use the parks and open space of the shoreline. /95/

Both state and national wildlife areas are open to the public and have various programs, activities, and policies. Visitor figures for two of the larger refuges are listed in Tables 8 and 9.

In summary, the most significant factor affecting remaining wetlands in the San Francisco Bay area is the continual pressure for development of lands in the bay area, including shoreline areas, to support the needs of an increasing population. Expansion of water-related industries, ports, and marinas represent a lesser demand on these areas. Counteracting these demands is a general public attitude of respect for the bay and support of wetlands conservation which has developed in the past 15 years.

TABLE 9

GRIZZLY ISLAND STATE WILDLIFE AREA

| Year | Waterfowl Hunters | Fishing | Birding and Nature Study | Other Recreation (sightseeing; dog training) | Total |
|---|---|---|---|---|---|
| 1980-81* | 11,780 | 18,166 | 1,305 | 6,703 | 39,954 |
| 1979-80* | 7,657 | 21,803 | 1,481 | 8,428 | 39,369 |
| 1978-79 | 12,111 | 28,789 | 1,147 | 8,550 | 50,597 |
| 1977-78 | 9,874 | 15,661 | 961 | 5,886 | 32,382 |
| 1976-77 | 13,743 | 22,496 | 1,062 | 4,661 | 45,262 |

*Closed part of the year due to flood damage to levees and repairs.
SOURCE: Manager, Grizzly Island State Wildlife Area.

TABLE 10

SAN FRANCISCO NATIONAL WILDLIFE REFUGE

Public Use Summary - 1981

| Activity | Number of People | Number of Activity Hours |
|---|---|---|
| Visitor Center | 28,492 | 9,497 |
| Self-guided Interpretative Trail | 41,845 | 29,892 |
| Guided Interpretation Tours; Schools, and Other Groups | 101 groups<br>4,002 students | 8,004 |
| Other Guided Interpretation | 2,624 | 5,248 |
| Environmental Education Center | 6,427 | 19,281 |
| Hunting | 1,800 | 7,200 |
| Fishing | 1,485 | 2,970 |
| Hiking Trails | 7,200 | 14,400 |
| Photography | 552 | 1,104 |
| Birding and Nature Study | 576 | 9,216 |
| TOTAL: | 95,003 | 106,812 |

AVERAGE VISITATION = 257 people per day

SOURCE: Manager, San Francisco National Wildlife Refuge.

## CENTRAL VALLEY

### HISTORY OF WETLANDS

#### Conditions and Changes

The Central Valley of California extends 400 miles from the City of Red Bluff in the north to Bakersfield in the south. It includes all or parts of 22 counties and encompasses 16,000 square miles. At its widest point, the valley stretches to a width of 60 miles but averages 40 miles. The valley is traversed by numerous major drainages: these are the Sacramento, Feather, Yuba, and American Rivers, and Butte and Cottonwood Creeks in the north, San Joaquin, Mokelumne, Tuolumne, Cosumnes, Stanislaus, Merced, and Fresno Rivers in the central part of the valley, and the Deru, Tule, and Kings Rivers, and Poso Creek in the south. These waterways all discharge into the Sacramento-San Joaquin Delta and eventually San Francisco Bay.

One observer described the southern valley, "...throughout the length and about the rim of the San Joaquin were a hundred or more oases, every one a veritable paradise, abundantly watered, shaded with beautiful trees, and filled to overflowing with game of all kinds...At all times these lakes and connecting sloughs as well as the San Joaquin River, were bounded with an almost impassable barrier of tules, willows, and mudflats. During times of high water the basin was filled to a great depth with flowing water, presenting a barrier passable with stock at probably not more than three places between the upper end of Kern Lake and San Francisco Bay." /137/

Prior to 1850, the Central Valley contained around four million of California's five million acres of permanent, seasonal, and tidal wetlands. The largest concentrations were in the Tulare Lake Basin and the Delta-Suisun regions (Figure 2). Some marshes were "overlow" lands, seasonally flooded by adjacent drainages. They attracted millions of wintering waterbirds. There were also large areas of permanent wetland in both the Sacramento and San Joaquin Valleys. /105, 137/

These historic marshes were probably composed of freshwater marsh species such as tules (*Scirpus* spp.) and cattails (*Typha* spp.). They surrounded large areas of open water. The Delta contained both fresh and brackish marsh species, including alkali bulrush (*Scirpus robustus*), Olney's bulrush (*Scirpus Olneyi*), tules, and common reed (*Phragmites communis*).

Extensive riparian woodlands once covered the floodplains of rivers and tributaries and lined sloughs in the Central Valley. Characteristic native riparian tree species are cottonwood (*Populus fremontii*), western sycamore (*Platanus racemose*), white alder (*Alnus rhomibifolia*), valley oak (*Quercus lobata*), and willow (*Salix* spp.). Typical understory species are blackberry (*Rubus procerus*), buttonbush (*Cephalanthus occidentalis*), wild rose (*Rosa* spp.), wild grape (*Vitis californica*), and mugwort (*Artemesia douglasii*). /104/

Along with millions of waterfowl, the wetlands of the Central Valley and delta were also inhabited by other water-associated species, such as wading birds, shorebirds, and river otter; tule elk were abundant. Diminished populations remain, but the tule elk is no longer resident. Two species - thicktail chub and giant garter snake, once widespread in slough, marsh, or riparian habitats - are now federally listed as endangered. One state designated endangered plant species, mudflat quill plant (*Lilaeopsis masonii*), occurs in the Delta. /16/

Information on the historic distribution and areal extent of wetlands and riparian forests in the Central Valley is only generally known. There is limited evidence now of the types and extent of wetlands in the individual drainage basins of the valley, certainly not enough to enable precise comparison of past and present conditions. The past and present hydrography of the Central Valley provides the best clues to distribution of water-related vegetation and wildlife habitats.

The Central Valley is most readily envisioned as a pair of lesser valleys - the Sacramento to the north, and the San Joaquin to the south. Through each a major river flows toward the Sacramento-San Joaquin Delta,

where the valleys and their rivers meet, forming an 1,100-square-mile deltoid "junction." The two valleys can, in turn, be divided into a series of drainage basins, each receiving the runoff of rivers from bordering mountains. There are five basins in the Sacramento Valley, two in the San Joaquin.

Sacramento Valley

Sandwiched between the Sacramento River and the Feather River is the northernmost drainage basin of the Central Valley, Butte Basin. This basin extends south from the city of Red Bluff to Butte Slough, Morrison Slough, and Sutter Buttes and includes parts of Tehama, Butte, and Yuba Counties (see Figure 4). Prior to development, Butte Sink, the lowest portion of Butte Basin, consisted of natural levees, channels, permanent ponds, and bulrush marshes and swamps flooded by winter overflow from the Sacramento River and Butte Creek. These wetlands were also fed by underground seepage.

West of Butte Basin, Colusa Basin extends from Stony Creek south to Cache Creek between the Coast Range and the Sacramento River. It includes portions of Tehama, Glenn, Colusa, and Yolo Counties. The Sacramento River historically joined with waters draining the east side of the Coast Range and flooded the basin marshes in winter and spring.

South of Butte Basin, the Sutter Basin extends to the confluence of the Feather and Sacramento Rivers. The Sutter Basin is contained within Sutter County. Historic overflow from the Sacramento River, Butte Sink, and the Feather River flooded much of the Sutter Basin in the winter and spring. A large portion of Sutter Basin was permanently flooded, providing breeding and wintering grounds for numerous waterbirds and other water-dependent animals.

The Yolo Basin (which contains part of Yolo County), is situated west of the Sacramento River between Cache Creek on the north and the Montezuma Hills and Sacramento-San Joaquin Delta on the south. Tidal

inflows affected much of the wetland area of this basin; historic maps depict tidal marshes extending nearly to Sacramento. The Sacramento and American Rivers and Cache Creek overflowed onto the basin during the winter. The low, central section of the basin supported permanent marsh, while its outer margins were seasonally flooded.

The American Basin lies between the Sacramento and Feather Rivers on the west and the Sierra foothills on the east and is bounded by Oroville on the north and the American River on the south. It includes parts of Butte, Yuba, Placer, and Sacramento Counties. Numerous rivers (the American, Yuba, Feather, Sacramento, and Bear) once flooded the basin during the winter, and two permanent lakes (Bush Lake and Fisherman's Lake) existed on the southern end of the basin near the City of Sacramento.

Sacramento-San Joaquin Delta

The Sacramento-San Joaquin Delta, spanning Sacramento, San Joaquin and three other counties, lies immediately south of Yolo and American Basins and north of the Stanislaus River. The pristine Delta was largely a tidal marshland, surrounded by slightly higher lands. Shallow backswamps flooded in winter and spring behind natural alluvial levees. In the spring virtually all of the Delta became a vast inland lake, covered by high tides from the San Francisco Bay and runoff from the Sacramento and San Joaquin Rivers. /21/

San Joaquin Valley

The San Joaquin Basin is contained within Stanislaus, Merced, and Madera Counties. It lies south of the Delta and north of the San Joaquin River between the Coast Range on the west and the Sierra foothills on the east. The major drainages of the basin (the San Joaquin, Fresno, Chowchilla, Merced, Tuolumne, and Stanislaus Rivers) overflowed to create an extensive wetland complex of permanent lakes, sloughs, ponds, marshes, and seasonal wetlands.

South of the San Joaquin Basin, the Tulare Basin forms the southern end of the San Joaquin Valley. This basin covers portions of Fresno, Kings, Tulare and Kern Counties. Within the Tulare Basin, three major ancestral lakes, Tulare Lake, Buena Vista Lake, and Kern Lake, provided the largest single block of wetland habitat in California.

The history of change to wetlands in the Central Valley is bound up in the history of reclamation, flood control, and water development. A brief review of these related developments will explain much about what has happened to Central Valley wetlands and riparian forests, for the present distribution of wetlands in the Central Valley does not resemble the historic distribution of this habitat. Rather, it is determined by the location and availability of water and arable land. Of the 250,000 acres of wetlands (6% of the original four million) that remain, /137/ few are in their native state. The great majority are managed wetlands, created and maintained by the seasonal or controlled application of water.

The history of wetlands reclamation and flood control differs somewhat for the Sacramento Valley and San Joaquin Valley. In the Sacramento Valley, including the central Delta, widespread reclamation began in the 1850s when the vast floodplains and tidal plains were diked for cultivation to meet the demands for farm products of the burgeoning gold rush population. The reclaimed areas flooded extensively each winter. Flooding was exacerbated by hydraulic mining upstream in the Sierras, which left heavy deposits of sediment in the waterways. A decade of dredging along the Sacramento River was required to restore its normal streambed level in 1924. Flood control in the Sacramento Valley was managed locally and in a piecemeal fashion until the inception of the Sacramento Flood Control Project in the 1910s, which greatly expedited the continuing reclamation of the Sacramento Valley. /80/ Reclamation in the Delta continued until by 1930 most of the present 886 islets and islands had been leveed and were being cultivated.

In the San Joaquin Valley, development proceeded in a somewhat different fashion. The San Joaquin was drier than the Sacramento Valley,

and intensive agriculture in this area did not become widespread until the turn of the century. The original European settlers grazed cattle on the valley grasslands. Overgrazing and drought eventually discouraged the rancing industry, and beef production gave way to the production of non-irrigated wheat. More efficient pumping systems provided groundwater for widespread irrigation, enabling much of the San Joaquin Valley to convert to intensive agriculture. Groundwater continued to be the major source of irrigation water in the valley through 1940. As groundwater tables were depleted, the need for a comprehensive program of water importation became apparent. Local irrigation districts formed to appropriate and import water. /80/

By the 1930s it was evident that a large scale system was required in the Central Valley primarily to control flooding in the delta and Sacramento Valley. Such a system could also provide the needed irrigation water to supplement groundwater in the San Joaquin Valley. The Central Valley Project (CVP) was passed by the state legislature but subsequently funded and built by the federal government in 1933. Shasta Dam, the most prominent of the upstream storage reservoirs in the CVP, was completed in 1949. In August, 1951, the pumping station at Tracy in the southern Delta began delivering Sacramento River water from the Delta into the Delta-Mendota Canal for transportation south into the upper San Joaquin Valley. The CVP still sends water south through the canal.

By the 1950s, there was evident need for more extensive flood control in the Sacramento Valley, and a more effective means of controlling sporadic intrusion of saline waters from the bay up into the Delta; this latter condition was particularly serious for agriculture in low flow years and at times of major levee failures and island flooding. Additional water was also needed for irrigation and urban use in southern California. The Burns-Porter Act of 1951 authorized the State Water Project (SWP), with construction of the Oroville Dam and Reservoir. The State Water Project was implemented in stages throughout the 1960s and now carries water from the Sacramento River and the Delta into the southern San Joaquin Valley and to the Los Angeles area. /26/

This is a brief account of one of the major land and water transformations in the western United States. Hundreds of thousands of acres of land were transformed over a period of about 100 years from "wet" land to "fast" land. What were massive gains for a growing agricultural economy became massive losses of wetland habitat. The greatest rate of wetland loss occurred in the Central Valley during the period 1906 and 1922, when extensive reclamation and effective flood control combined to accelerate the creation of irrigated and agricultural lands.

Reclamation and flood control were also responsible for gradual elimination of much of the riparian forest throughout the Central Valley and Delta. In the Sacramento Valley, the estimated 775,000 acres of native riparian woodland present in 1850 were reduced by 1952 to about 20,000 acres, and by 1977 to 12,000 acres or less. /137/ The upper Sacramento Valley has sustained more recent losses of riparian vegetation. High terrace riparian vegetation in Colusa and Butte Basins has drecreased 53% since 1952, low terrace vegetation has declined 21%, and ox-bow lakes have declined 23%. /104, 137/ Much of this original woodland was cleared for levee construction and maintenance or for conversion to agriculture. Remaining riparian vegetation in the Sacramento Valley exists along the upper reaches of the Sacramento River from Red Bluff south to Colusa. Woodlands occur on the Feather River (especially between the confluences of the Yuba and Bear Rivers with this drainage), and on the upper reaches of the American River and along the Consumnes River to its confluence with Mokelumne in the eastern Delta. /89/

Riparian vegetation was never as extensive along the drainages and smaller floodplains of the San Joaquin Valley as it was on the large rivers of the Sacramento Valley. Most of the riparian habitat in the San Joaquin Valley has been cleared and the land converted to agriculture. Important remnants remain on the San Joaquin River from a point approximately ten miles north of its confluence with the Stanislaus River south to at least the Merced River, and along the Stanislaus River, especially near its convergence with the San Joaquin River. A few remnants of

riparian forest skirt the southern, eastern, and northern periphery of the Delta. /89/

The major effect of the massive losses of Central Valley wetlands habitat over the years has been corresponding depletion of wintering waterfowl and wildlife populations. According to the U. S. Fish and Wildlife Service, "The most important single function of remaining wetlands is to provide wintering, not breeding, habitat for waterfowl." Most of the Pacific Flyway waterfowl breed in western Canada and Alaska. /137/ Central Valley wetlands and agricultural lands provide winter habitat for about 60% of the Pacific Flyway's waterfowl. Thus, the wintering grounds continue to support high numbers of waterfowl, but on less and less habitat. This loss of wintering habitat in the Central Valley has progressed to the point where wintering habitat, not breeding habitat, is limiting flyway populations. /137/ Table 10 lists waterfowl populations in the various basins.

Similarly, the dramatic reduction in riparian forests has been paralleled by decline in populations of many non-game species of birds. The yellow-billed cuckoo, known to inhabit riparian forests north and south of the Delta, is on the state's list of rare and endangered species by virtue of loss of habitat. The remaining riparian forests of California are particularly critical as productive ecosystems, utilizing the seasonal abundance of water in California's Mediterranean-type climate and sustaining its benefits throughout the dry season as water-related habitat.

Development of Managed Wetlands

In a region that is as intensively managed for production as the agricultural Central Valley, other land uses, especially those that demand water, must also be managed. Wetland habitat is just one of the uses that compete for land, water and energy in the valley. The majority of wetland habitat within the Central Valley is privately owned or leased by organized duck hunting clubs, ranchers or farmers. Publicly owned

TABLE 11

CURRENT MIDWINTER WATERFOWL USE OF

THE CENTRAL VALLEY AND BASINS

| Average Populations | Total Waterfowl | Percentages |
|---|---|---|
| Pacific Flyway | 9,348,006 | 60% |
| California | 6,228,486 | 91% |
| Central Valley | 5,652,191 | - |
| Butte Basin | 1,419,724 | 25% |
| Sutter Basin | 388,321 | 7% |
| District 10 | 47,657 | 1% |
| Colusa Basin | 961,466 | 17% |
| Yolo Basin | 295,927 | 5% |
| American Basin | 38,273 | 1% |
| Delta | 477,117 | 9% |
| San Joaquin Basin | 1,687,662 | 30% |
| Tulare Basin | 208,056 | 4% |

Source: U.S. Fish and Wildlife Service, 1978. Concept Plan for Waterfowl Wintering Habitat Preservation, Central Valley, California

wetland areas include federal National Wildlife Refuges (NWRs) and state Wildlife Management Areas (WMAs). These areas were originally created to offset waterfowl depredation on agricultural lands and, later, to provide recreational opportunities. The management of extensive, subsided reclaimed agricultural lands in the Delta indirectly promotes waterfowl habitat. These lands, which are subject to salt buildup for a variety of reasons, are leached by flooding either annually or sporadically. This practice creates seasonal "wetland" habitat that resembles the pristine, pre-reclamation condition and supports numerous migrating waterfowl.

Generally, areas which are managed as wetlands *per se*, are flooded during the fall and winter to encourage the growth of plants such as swamp timothy (*Heleochloa schoenoides*), pricklegrass (*Crypsis niliaca*), alkali bulrush (*Scirpus robustus*), jointgrass (*Paspalum distichum*), smartweed (*Polygonum lapthifolium*), and spikerush (*Eleocharis macrostachya*). /26/ Cattails (*Typha* spp.), tules (*Scirpus* spp.), sedges (*Carex* spp.), and rushes (*Juncus* spp.), common reed (*Phragmites communis*) and numerous other species populate permanent, freshwater marshes on areas that are flooded year-round. Less regularly flooded agricultural lands (rice, corn stubble) provide secondary wetlands habitat for some waterfowl species.

Sacramento Valley

In 1931, the state purchased the Gray Lodge Wildlife Management Area in the Butte Basin area. Originally part of a gun club, the 2,540-acre area was inviolate (not open to hunting) until 1953. The refuge has been enlarged twice since 1952 to its present 8,400 acres. /88/ It is intensively managed to produce waterfowl and for wintering birds. During peak years the area attracts as many as one million wintering waterfowl, but normal populations do not exceed 550,000 birds. /137/ Around 6,000 acres

of the area are flooded at least part of the year; of these, 400 are flooded year-round.

The Sacramento National Wildlife Refuge was the first federal refuge created in the Central Valley. Located in the Colusa Basin, it was established in 1937 under Executive Order and funded by the duck stamp program. The 10,776-acre refuge was founded to prevent waterfowl depredation of local croplands. Delaware NWR and Colusa NWR were established in the Colusa Basin in 1945 and 1962 with duck stamp funds. Managed as a unit, the three NWRs total 20,450 acres and consist of permanent and seasonal wetlands, ponds, prairie uplands, and crops. Together they provide more than 150 million waterfowl-use days annually and are especially important to geese wintering in the Central Valley. /137/

Sutter NWR, located in the Sutter Basin, was created in 1944 under the Lea Act which authorized the Secretary of Interior to purchase land at suitable locations in California for the purpose of managing migratory waterfowl to prevent depredation of agricultural crops. The refuge presently totals 2,590 acres in Sutter County. It averages 41.4 million waterfowl use-days annually, and peak waterfowl populations on the refuge may reach 900,000.

Lower Sherman Island Wildlife Management Area, established in 1965, is located in the Sacramento-San Joaquin Delta. It consists of 3,300 acres of which 314 acres are flooded. The western tip of the island was used for the deposit of dredge spoils.

A vast amount of wetlands habitat in the Central Valley is in privately owned duck clubs. In the Sacramento Valley there are 305 clubs, comprising 111,094 acres. /35/ This figure is augmented by the Sacramento-San Joaquin Delta which contains 25 clubs totaling 25,249 acres.

San Joaquin Valley

The first State Game Refuge was created in the San Joaquin Basin in 1929. The Los Baños Game Refuge, originally part of the vast holdings of the Miller and Lux Land and Cattle Company, was purchased by the state. /137/ The refuge (now the Los Baños Wildlife Management Area), was originally created to protect wintering waterfowl and was not opened to hunting until 1953. In the 1940s cereal crops were grown on the refuge to prevent depredation by waterfowl of surrounding cultivated lands. /208/ Of its 3,000 acres, 1,200 acres are flooded seasonally and 500 acres are flooded year-round. The area is important wintering habitat for the Aleutian Canada goose, a species listed as endangered by the federal government. /137/

Volta Wildlife Management Area, established in the San Joaquin Basin in 1952, is a 2,700-acre area which was formerly grazing land. The land is leased from the Bureau of Reclamation for wildlife habitat, and the entire area is flooded during the winter. /208/

In 1951, the 2,560-acre Merced NWR was established in the San Joaquin Basin also under the Lea Act. Waterfowl food crops are grown on the refuge and a small portion of it is flooded year-round. The San Luis NWR and the Kesterson NWR, also in the San Joaquin Basin, were created in 19[illegible] and 1970. San Luis NWR (7,340 acres) was purchased with duck club funds under the Migratory Bird Conservation Act. The refuge, created as mitigation for construction of the San Luis Reservoir, contains seasonal and permanent marsh. /179/ The reservoir itself, created in 1967, holds as many as one million ducks during the hunting season. Kesterson NWR is the most recently created Central Valley NWR. The 5,900-acre refuge consists of large shallow evaporation ponds at the present terminus of the San Luis Drain, which hold return flow from irrigation lands. All the agricultural return water flowing into the San Luis Drain is presently disposed of through evaporation from these ponds. /179/

Mendota Wildlife Management Area, located in the Tulare Basin, was acquired in 1954 by the State Wildlife Conservation Board. Over two-thirds of the 10,000-acre WMA is seasonally flooded and the area is the largest

piece of public owned marsh in the San Joaquin Valley. /137/ The refuge holds up to 250,000 waterfowl during the winter. /175b/ South of the WMA are Kern and Pixley NWRs, which provide limited wetland habitat most years. Pixley NWR (4,328 acres), established in 1959 by executive order, primarily serves to protect the habitat of several terrestrial endangered species and supports little wetland most years. The 10,616 Kern NWR was created in 1961 from ranchland, primarily to restore waterfowl habitat in the San Joaquin Valley. /158/ No year-round wetlands exist on the refuge but from 800-3,200 acres are flooded each fall to create wintering habitat for waterfowl.

A total of 348 clubs (156,068 acres) are located in the San Joaquin Valley. Thus, the approximate total acreage from Central Valley duck clubs is 292,400 acres; however, only about half of this acreage is retained as "natural" wetland habitat; the remainder is farmed. /35/

The most significant remaining marshes are part of the "Grasslands." The Grasslands are divided into the East and West Grasslands by the San Joaquin River. Much of the West Grasslands is included in the Grasslands Water District, which distributes water expressly for the maintenance of wetlands for waterfowl hunting, conservation purposes, and cattle grazing.

EVALUATION OF FACTORS

The Central Valley is the "food basket of California," producing half of the state's farm income. The valley, with its level terrain, productive soils, streams and groundwater for irrigation, and long season with a dry harvest period, is superbly endowed for the production of many types of agricultural crops. Some of the present agricultural uses of the valley have been practiced since it was initially settled around 150 years ago, while others developed in the twentieth century. Livestock ranching and grain farming, the first major land uses of the valley, still exist in peripheral regions or in conjunction with other uses. Today, the wheat and barley grown along the valley edge is used for local flour, beer, or livestock feed rather than for export. Irrigated agriculture, presently the major use of the valley, was not practiced on a large scale until the twentieth century.

Cotton is the leading value crop of the state and is grown primarily in the southern San Joaquin Valley. Rice is cultivated mainly in the south-central portion of Sacramento Valley in Butte, Colusa, Glenn, Sutter, and Yolo Counties. Sugar beets are grown throughout the Central Valley, as are fruits, nuts, and vegetables. /55/

The development of efficient irrigation and flood control practices in the early twentieth century enabled the large scale reclamation of Central Valley wetlands for agriculture. Today, numerous related factors contribute to the agricultural priority over wetland habitat. Among these, economics is a key factor. Land values present an incentive to convert marsh to croplands; gun clubs often pay higher taxes than surrounding agricultural areas; and hunting incentive has been eroded by rising costs. Managed wetlands must compete for limited water supplies, and marsh waters can be polluted by nearby agricultural and industrial waste discharge. More efficient farming practices reduce available waterfowl food, and land-leveling techniques eliminate pockets of wetlands on rice fields. And finally, to the detriment of the wetland resource, local duck club owners are not well organized. /137/

Conversion to agriculture has been one of the major factors in eliminating Central Valley wetlands and remains so today. In both the Sacramento Valley and the San Joaquin Valley, large acreages of private duck clubs recently have been converted to agriculture. Losses within the boundaries of the three project areas of the U. S. Fish and Wildlife Service conservation easement program are substantial./138/ In the 10,900-acre Butte Sink, over 600 acres of managed marshland have been converted to agriculture in the last five years.

Other major wetland losses in the Central Valley have occurred in Tulare Basin, which historically was the most important area for wintering waterfowl in California. Although in this basin the Kern NWR has been recently recreated and the Mendota NWA has increased its wetland acreage, the flooded acreage held in private duck clubs declined by 14% from 1960 to 1973. /137/ The rate of wetlands conversion in the 60,000-acre West Grasslands area is even

greater; 14%, or 8,800 acres, have been lost only in the last five years. /137, 138/ Wetlands in the Grasslands area of the San Joaquin Valley are being converted to sugar beets, cotton, or other crops that have no waterfowl habitat value. Farther south, in the Kern County area, the conversion is also to cotton. In this area, as well as in the Grasslands, conversion to agriculture is necessitated by the high costs of pumping well water.

In the Colusa Basin and the American Basin, some natural marsh areas are being put into rice production. In the past five years, 2,000 acres of native wetland in the Willow Creek-Lurline area of Colusa Basin have been converted to rice. Duck clubs convert to riceland largely for economic reasons. As the costs of operating the clubs rise, more hunters will be allowed to shoot on the club in an effort to reduce the costs per hunter, resulting in lower hunting success.

Higher costs and fewer ducks have prompted many clubs to convert part of their lands to rice, since this crop will provide revenue as well as attract some waterfowl. However, in at least one instance, former duck club lands that had been converted to rice were restored to waterfowl habitat to regain habitat quality and improve hunting success. /157/ Such restoration activities may be a future trend in areas where conversion to rice has diminished hunting success.

Ricelands provide some food for waterfowl, but the quality of the habitat is inferior to native marsh or lands that are managed for waterfowl foods. Nonetheless, the conversion of ricelands to other crops such as orchards is more detrimental to water-related wildlife, not only because secondary wetland habitat is lost, but also because drainage water from the ricelands can be used to flood other wetlands. For instance, the major source of water to the Willow Creek clubs in the Colusa Basin at present is runoff from ricelands. Conversion from rice to other crops in this area could eliminate that water source and alter also the timing of water availability. In the upper Butte Basin,

ricelands and, thus, the duck clubs which depend on riceland runoff water, are both threatened by conversion to orchards.

Duck club lands are sometimes taxed at a higher rate than are nearby agricultural lands. In Butte Sink, duck club wetlands are taxed more heavily than surrounding agricultural lands because the clubs are classified as recreational rather than agricultural land. Rising taxes are also threatening duck clubs in Colusa, San Joaquin, and Tulare Basins. This inequity could accelerate the rate of wetlands loss in the Central Valley as smaller duck clubs are forced to convert their lands to other uses.

The major threats to already existing state, federal, and privately owned wetlands in the Central Valley are the availability of water and its related energy cost. Most of the NWRs and WMAs receive federal water delivered to these areas through state irrigation districts on an "if and when available" basis. The Central Valley Project does not authorize that water be allocated to wildlife management areas. Consequently, federal water must be distributed first for metropolitan and agricultural uses. /157/ Privately managed wetlands depend on federal and local water. Thus, future water flows to Central Valley wetlands are not assured, particularly since water demand in Central California is projected to increase by about 14% between 1980 and the year 2000. /101/

The problem of water distribution to wetlands is particularly acute in the San Joaquin Valley, where much of the water is obtained from deep wells. Due to overdraft of the aquifers and the rise in the price of electricity, the costs of procuring this water have risen astronomically in the past few years. For instance, the U. S. Fish and Wildlife Service in 1976 spent $46,000 to flood 1,000 acres of habitat on the Merced NWR. Only six years later, a little more than half that acreage (590 acres) was flooded on the refuge at a substantially higher cost ($55,000). Next year, projected allocations will only allow flooding of 320 acres. /210/

Technological advances in agronomy have affected the rate of wetlands loss or the acreage of secondary wildlife habitat in this area. Changes in agricultural practices have drastically reduced both the extent and value of ricelands and other agricultural croplands to waterfowl. It is estimated that the wildlife-carrying capacity of irrigated crops is about 25-30% of what it was 25 years ago. /105/ "Clean farming" in the Delta tends to reduce the amount of waste grain and stubble left in harvested grain fields and eliminate pockets or ditches with useful "weedy vegetation."

Laser beams are now used to level flood-irrigated land. Rice fields which have been leveled and smoothed by this technique may be rapidly drained, reducing the growth of water-associated plants other than rice which normally provide some food for waterfowl. Fewer levees are needed to control the water on laser-leveled fields; thus, the amount of wildlife habitat is reduced.

Early maturing rice strains have been developed which allow rice fields to be plowed during the early fall. In addition, harvesting efficiency of the rice has increased from 65% to 90% in the last 25 years. /105/ Herbicides are used to control weedy vegetation in the fields. An early, "clean" rice harvest has eliminated much of the waste grain on which wintering waterfowl used to feed. Also, there are fewer weeds to provide food and cover for wildlife. In addition, increased harvest efficiency has reduced the amount of corn and other grains left for waterfowl in delta fields.

Wetlands have been indirectly degraded by agricultural practices. Marsh waters are likely to be polluted by pesticides, herbicides, high concentrations of salts, nutrients, oil, and other agricultural and industrial wastes.

Duck clubs offer the most positive means of ensuring that private wetlands are maintained. However, in many areas of the Central Valley they remain largely unorganized. /137/ The need for hunters to organize to preserve the private wetlands will be crucial if the clubs are to

resist increased taxes, economic pressures to convert wetlands to agriculture, and threats to the water supply

The political ethos of Delta and other Central Valley counties and communities is one of "home rule;" interference from either state or federal officials or their regulations is viewed with distrust unless they serve recognizable economic interests. There are not strong conservation organizations with large grass-roots constituencies in the Central Valley, except in the major urban centers. Even then, the concerns are more likely to be parochial. That there are any wetland preserves in the Delta and Central Valley is testament to the political pressure of waterfowl hunting interests.

There is evident social value in the wetlands in the Central Valley, reflected in the high visitor use of the public wetland areas (NWRs and WMAs). These areas are used by hunters, fishermen, bird watchers, photographers, and students. Visitor use days of some of the refuges are listed in Table 11.

TABLE 12

VISITOR USE OF CENTRAL VALLEY REFUGES

BASIN NWRs VISITOR DAYS

| Fiscal Year 1980 | Hunting | Fishing | Total Visits |
|---|---|---|---|
| Sacramento NWR | 5,803 | 400 | 29,860 |
| Delevan NWR | 4,395 | 650 | 4,903 |
| Colusa NWR | 3,714 | 575 | 5,985 |
| Sutter NWR | 3,338 | 550 | 3,768 |
| Fiscal Year 1979 | | | |
| Sacramento NWR | 4,920 | 625 | 20,084 |
| Delevan NWR | 3,795 | 625 | 7,161 |
| Colusa NWR | 3,472 | 550 | 10,236 |
| Sutter NWR | 2,762 | 525 | 5,024 |
| Fiscal Year 1978 | | | |
| Sacramento NWR | 5,312 | 535 | 16,162 |
| Delevan NWR | 4,112 | 585 | 4,477 |
| Colusa NWR | 4,383 | 445 | 6,818 |
| Sutter NWR | 2,796 | 460 | 537 |

Source: Marguerite Hill, Sacramento NWR

Table 12 Continued

KERN NWR ACTIVITY HOURS

| | Refuge Tours | Hunting | Camping | Picnicking | Wildlife Observation | Photography |
|---|---|---|---|---|---|---|
| FY 1981 | 121 | 12,310 | 21,200 | 810 | 701 | 5 |
| FY 1980 | 151 | 11,610 | 18,012 | 525 | 655 | 33 |
| FY 1979 | 297 | 15,060 | 23,280 | 545 | 810 | 0 |
| FY 1978 | 1,655 | 4,445 | 6,025 | 135 | 920 | 25 |
| FY 1977 | 969 | 2,960 | 7,800 | 140 | 446 | 18 |

Source: Manager, Kern NWR

THREE WILDLIFE MANAGEMENT AREAS FOR 1980-1981

VISITOR DAYS

| SAN JOAQUIN BASIN | Hunting | Fishing | Nature Study | Sightseeing |
|---|---|---|---|---|
| Los Banos WMA | 3,763 | 12,702 | 2,222 | 1,325 |
| Volta WMA | 4,736 | 2,602 | 165 | 232 |

Source: Roger Wilbur, California Department of Fish and Game

| COLUSA BASIN | Hunting | Non-Hunting | Educational |
|---|---|---|---|
| Gray Lodge WMA | 13,000 | 45,000 | 14,000 |

Source: R. B. Reno, Manager, Gray Lodge WMA

## SOUTH COAST REGION

### HISTORY OF WETLANDS

The South Coast region includes six counties: San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange and San Diego. Coastal wetlands occur at the tidal mouths of rivers and bays and coastal lagoons. Most coastal marshes experience high salinity levels in summer as freshwater runoff slackens and closed lagoons become hypersaline. Salt marsh is the dominant wetland type; tidal mudflats extend into shallower estuaries. Pickleweed (*Salicornia pacifica*) and cordgrass (*Spartina foliosa*) occupy the lowest elevations. Intermixed with the pickleweed are other halophytic species (*Batis maritima, Jaumea carnosa, Triglochin concinnum, Salicornia subterminalis*). Brackish and freshwater marsh may have occurred at one time in the upper portions of some large estuaries and in wetlands fed by artesian springs (e.g., Freeman River at Bolsa Chica Bay) or those with large river inflows. /139/

A total of twenty-eight estuaries and wetlands occurred along the south coast in 1850 prior to development. /133/ These wetlands were discontinuous in distribution, each associated with a separate river system. The size and character of each was a product of its particular hydrologic regime, degree of protection, and location on the coast. /148/

Riparian vegetation consisting of cottonwood, alder, willow, and freshwater marsh species lined most of the coastal rivers. The width of riparian vegetation was a reflection of the summer water levels of the watercourse rather than flood flows; consequently, the wide floodplains of many rivers held but a narrow strip of riparian vegetation. /147/ No estimates of original or current riparian acreage exist, although there is sporadic information on significant losses of riparian vegetation.

The wetlands of the South Coast region may be separated according to certain subregions of the coast distinguished by topography, climate, and development patterns. The counties of Santa Barbara and Ventura serve as one unit, as do Los Angeles and Orange counties. The two peripheral counties of San Diego and San Luis Obispo are sufficiently distinct to stand alone. (See Figure 4)

Each subregion has undergone different urban and industrial development phases, with accompanying decreases in wetland acreage. Population growth first centered in the Los Angeles metropolitan area, which began rapid urbanization in the 1920s. Orange County growth followed later, as did San Diego County in the 1940s and 1950s. The northern counties in the region have not sustained as great increases in population. Pages 96 - 111 present a detailed account of the historic changes to each of the principal wetland areas of this region.

San Luis Obispo County

San Luis Obispo County has two important wetlands and several smaller areas. Morro Bay is the last large relatively undeveloped estuary in southern California. This lagoon has 1,452 acres of tidal flats and 472 acres of salt marsh. /36/ It has not sustained great losses of wetlands despite the surrounding settlements. The Morro Bay area was settled first by the Spanish and later by Americans, who founded the town of Morro Bay. The first wharves were built in the late 1800s, and the area became a small shipping and fishing town. In the 1940s the Army Corps of Engineers constructed a harbor, and a prosperous fishing industry became established. In 1950 a record 11 million pounds of sardines were caught. Abalone and sport fishing as well as oyster farming developed on the bay.

Population doubled between 1950 and 1960. However, the bay has not been urbanized to a great extent, and its wetlands remain intact. The California Department of Parks and Recreation and the Department of Fish and Game own the majority of the tidal and wetland areas. The greatest impact on the bay wetlands has come from siltation resulting from erosion on overgrazed lands and other land uses in the watershed. /28/

Sedimentation has added 280-420 acres of vegetated wetlands and tidal flats in replacement of open water. /140/ There are some plans to develop resort facilities adjacent to the marshland along the southern portion of the bay. Waterfowl use of the bay is significant, with 25,000 birds counted in one day. Sport fishing and clamming also are popular uses of the bay. /36/

Nipomo dunes in the southern portion of the county is a complex of sand dunes, with interior freshwater lakes, and coastal wetlands. There are five principal wetlands in the complex: Pismo Marsh, Oceano Lagoon, Dune Lakes, Oso Flaco Lakes, and the Santa Maria River mouth. With the exception of the river mouth, these wetlands are freshwater and are tucked in depressions amongst the sand dunes. The freshwater wetlands and lakes total 1,285 acres and have not been changed greatly by settlement of the surrounding area.

The Pismo Dunes comprise a recreational area for off-road vehicles (ORVs) as well as a state park. Dune buggies and other vehicles destabilize sand, which drifts into the lakes and has threatened their continuance. /106/ The Department of Fish and Game and Department of Parks and Recreation own the majority of these areas. Oso Flaco Lakes is privately owned, but is being considered for acquisition under the expansion of Pismo Dunes state park. The Department is presently suing an upstream developer to remove sediment deposited several years ago in their ecological reserve at Pismo marsh.

The Santa Maria River mouth encompasses 170 acres of riparian vegetation, 35 acres of salt marsh, 90 acres of mudflat, and 20 acres of freshwater marsh. The river mouth is heavily used by shorebirds. /106/ Some of the floodplain vegetation has been removed for agricultural use and grazing, but a dense riparian corridor lines much of the lower river. Several small wetlands occur at the mouths of creeks in the northernmost portion of the county. /25/

Population growth has remained slow in this county, and agriculture is the dominant land use. From 1970-1980, population increases averaged 5,000 new inhabitants per year. Projected increases for 1980-1985 show an average gain of 4,800 residents per year. /99/ To date, wetlands have not been seriously threatened by urban growth. Tourism along the scenic coast, and particularly in Morro Bay, tends to discourage development as does a county policy limiting growth. /99/ The primary threats to wetlands in the county are indirect, arising from sedimentation from watershed uses and recreational ORVs.

Santa Barbara and Ventura Counties

The wetlands of these two counties are small marshes at the mouths of creeks and rivers and several larger lagoon systems. In northern Santa Barbara County, a series of wetlands is almost entirely contained within the boundaries of Vandenberg Air Force Base (VAFB). From north to south they are: Shuman Creek, San Antonio Creek, Santa Ynez River, Cañada Honda Creek, and Jalama Creek. The Santa Ynez River is the largest watercourse on the Base. A 400-acre lagoon, ringed with tidal wetlands and mudflats, lies behind the sand bar which forms at the river mouth during summer months. Salt and freshwater marshes in the remaining creeks total 7 acres; riparian vegetation 379 acres. /61/

For several reasons these wetlands have escaped major disturbance. Early use of the land was for grazing; a great human population center never developed. In 1941 the Air Force purchased a large area of coastal land and continues to hold and manage it as Vandenberg AFB. The containment of the land as a military reserve has prevented disruption of the wetlands. Other uses of wetland areas include public education and recreation programs at prescribed locations on the AFB. The Santa Ynez River bottomlands, including wetlands, are also leased out as part of a grazing tract.

The greatest potential problems in these areas are from military construction or filling, and degradation of water quality originating

from upstream pollutants. However, neither of these has posed a major threat nor appears to be an imminent threat. /61,25/

Goleta Slough is a large wetland area sandwiched between the town of Goleta near Santa Barbara and the ocean. This marsh was once a deep water harbor until a massive flood in 1861 filled the slough with silt from the surrounding mountains. A shallow lagoon was left and salt marsh invaded the new tidal flats. Filling along the slough's periphery in the 1940s for the University of California, Santa Barbara Airport and other properties has reduced the area of the marsh from 1,100 to 360 acres.

The majority of the slough is salt marsh dissected with open water channels. /109/ The Santa Barbara City Flood Control District periodically dredges the slough channel to avoid flood problems on the adjacent filled lands. Catchment basins have been excavated on two of the main tributaries to the slough to offset continuing siltation from watershed development and agricultural activities. /117/ The City of Santa Barbara owns the slough, and the Department of Fish and Game has acquired portion of it as an ecological reserve.

Carpinteria Marsh surrounds a lagoon formed at the confluence of two creeks on the coast of Santa Barbara County. The periphery of the marsh has been filled; the original acreage was approximately 270 acres. The first development of the area began with the construction of a rail line in the upper area of the marsh. The marsh was a favorite waterfowl hunting area in the early 1900s. In 1925 the southern spit marsh became the "Sandyland" housing tract, and by the 1970s urban development surrounded the marsh. In the 1960s the County Flood Control District dredged drainage channels through the marsh and stabilized a permanent ocean outlet with riprap. Maintenance dredging is performed periodically for flood control of upstream regions. The majority of the marsh is privately owned, excepting a 120-acre portion owned and managed by the University of California Natural Land and Water Reserve System. Public

access and use of the area is thus limited. Siltation has been a continuing problem in the marsh, which experiences many floods. Expanding urbanization of the surrounding area (Carpinteria Valley increased in population 100% between 1950 and 1970) could induce greater sedimentation. /56/

Ventura County

Primary wetland areas in Ventura County lie at the mouths of the Ventura and Santa Clara Rivers and at Mugu Lagoon.

The majority of the former wetlands at the Ventura River mouth have been filled, and only 10 acres remain. The Santa Clara River has an estuary of 60 acres and several associated wetlands, McGrath Lake (40 acres), and Ormand Beach. Riparian vegetation is common along the two rivers. Fill for urbanization, oil production, and adjacent recreational use and flood control projects have caused the major wetland and riparian losses. /25/ Filling continues to threaten these wetlands. /147/

During the late 1800s, Mugu Lagoon covered nearly 3,000 acres, paralleling the coast for four miles. The lagoon and wetlands remained undisturbed until the 1940s, when the Navy acquired the area, dredged the central lagoon 30 feet deeper, and filled adjacent salt marsh and uplands. The lagoon's acreage has been reduced by 50% but remains within the Navy's Pacific Missile Test Center. Access to the lagoon is restricted except for hunting by Center personnel. Six hundred and twenty acres of freshwater duck clubs lie outside the Navy property near the lagoon.

Sedimentation is occurring in the lagoon partly in response to urbanization of the watershed. Between 1960 and 1970 the watershed's population increased by 112,000 inhabitants. Future flood control projects in the upper drainage area could also affect the lagoon./57/

Santa Barbara County increased greatly in population during the 1950s and 1960s (5.6% per year), but reduced its growth rate during the 1970s to 1.2% per year. Projections indicate an increase of 3,100 new

residents, many of which are expected to reside in inland areas. The City of Santa Barbara has grown very little since 1976. Ventura County as a whole has experienced great increases in the past ten years, particularly in the Simi and Conejo Valley areas. Expected growth rates are 2.8% per year for 1980-1985. /99/ These population increases present an indirect problem for the counties' wetlands through accelerated sedimentation in watersheds. Direct filling of marshes has not yet been proposed; riparian habitats are more likely to be encroached upon.

Los Angeles and Orange Counties

The wetlands of these two counties have sustained the greatest proportional losses of any region of coastal California. Only 10% of the original wetlands in these counties remain. /139/ Historically, there were seven major coastal wetlands totalling 17,300 acres. Each has been either partially or totally filled or dredged and developed primarily for urban use, military reservations, or harbor facilities. /133/

The early Spanish settlements were concentrated inland and had little effect on the coastal swamplands. American inhabitants began to settle on the coast in the mid-1800s. Many of the marshes were developed as gun clubs in the 1880s. The area of coastline from Long Beach to Newport Beach was "one of the greatest habitats for wildlife and game birds in the world." /108/ Twenty-three gun clubs dotted the coastline by 1900.

The railroad arrived in the 1880s, and during the 1890s Los Angeles doubled in population. The next boom period, 1902-1914, saw Los Angeles triple in size and San Pedro become the principal seaport. The appropriation of an adequate water supply via the Los Angeles Aqueduct furthered the city's growth, and shipbuilding became a principal industry during WW II. Oil fields were discovered between 1917 and 1929, and in the 1930s the Los Angeles area added a half a million new residents. The construction of the Colorado Aqueduct in 1941 further stimulated metro-

politan growth. A fourth growth period occurred between 1945 and 1969, with a vast proliferation of housing tracts and shopping centers as the aerospace industry grew, bringing workers and housing. By 1970 the City of Los Angeles had a population of 9 million and a contiguous metropolis extending 20 miles around the city. Predictions for the county show increases in population of .79% per year.

In Orange County, urbanization began in the 1950s as communities replaced citrus groves. Although oil had been discovered in the coastal plain in the 1920s, the boom of the aerospace industry in the 1950s triggered urban growth. /55/ Between 1950 and 1960 the counties' population tripled. The last decade shows an addition of 500,000 new residents. Projections are for a 2.1% population gain between 1980 and 1985. /99/ While projections of population do not indicate increases in coastal inhabitants, they do reflect expected trends in the region as a whole which affect remaining wetland resources. Wetland losses accompanied the rapid expansion of Los Angeles and Orange Counties.

The Ballona Creek marsh in northern Los Angeles County was originally 1,550 acres until 1928 when the major lagoons were drained and the land was reclaimed for agriculture and the installation of oil and gas wells. During the 1960s a residential marina project, Marina Del Rey, was created out of 800-900 acres of the remaining salt marsh. /33/ The remaining 200-300 acres of wetland /187/have been isolated from tidal flows by levees, roads and ot her fill and are under extreme development pressure due to their proximity to metropolitan Los Angeles. /25/

Los Cerritos Lagoon, originally composed of 2,400 acres, was reduced by piecemeal filling for residential uses to 188 acres. /187/

Wilmington Lagoon of 3,450 acres was situated at the mouth of the Los Angeles River and former mouth of the San Gabriel River. Along its shores grew the cities of San Pedro and Wilmington. Reclamation began in 1841, and the railroad reached this region in 1869. The federal government constructed a breakwater at San Pedro in 1891. The major reclamation

of the marsh and construction of the Los Angeles/Long Beach Harbor proceeded between 1890 and 1930. The Corps of Engineers completed a large flood control project and re-routing of the Los Angeles River in 1923 to decrease sedimentation of the Port. The Port continued to enlarge through the 1970s, as shipping demands increased. /85/ Presently there are 5-6 acres of wetland left of the Wilmington Lagoon. The Port is continuing to enlarge by filling subtidal areas to create land.

Alamitos Bay, with 2,400 acres of wetland at the San Gabriel River mouth, was filled, beginning in 1907 with the City of Naples, through the 1920s for urban development. About 50 acres remain in a degraded condition along New River Slough.

The San Gabriel River has been channelized and developed for much of its length, with concomitant losses of riparian vegetation. In certain portions of the river, Los Angeles Municipal Water District cuts the riparian forest from borders of their groundwater recharge gravels in order to reduce water losses. /209/

Anaheim Bay, a coastal wetland of 2,300 acres, was first affected by the expansion of the oil industry in Huntington Beach and a loss of acreage for fill. In 1944 the Navy acquired 5,000 acres of the area, including the Bay, and built the Seal Beach Naval Weapons Station. Creating a harbor, constructing wharves, bunkers, roads, dikes, islands and other fills for the general development of the ammunition depot reclaimed approximately 600 acres. When lands for the base were condemned by the federal government, mineral rights were retained by the former owner, the Alamitos Land Company, and in 1954 the first oil well was drilled atop fills in the marsh. The next big change occurred in 1960, when 868 acres, primarily marsh land of Anaheim Bay, were acquired by the Huntington Harbour Corporation to build a marina-oriented residential community. Dredging and filling began in 1961, and in the next 14 years that portion of the Anaheim Bay salt marsh behind Sunset Beach was totally reclaimed. In 1962 a strip of marsh land at the south end of the Naval Weapons Station was declared surplus by the Navy and offered to Orange County at half the market value. The 63-acre parcel

was bought by the county for a marina and park. Filling began in early 1963 and took several years.

In 1964 Anaheim Bay was designated a Navy Wildlife Refuge. The same year, the U. S. Navy, U. S. Fish and Wildlife Service and the State Department of Fish and Game worked out a cooperative agreement providing for preservation of fish and wildlife resources in the refuge. The refuge was eventually transferred to the Fish and Wildlife Service with no public access allowed. A total of 750 acres of marsh remain within the refuge. /17/

Bolsa Bay was originally not connected to Anaheim Bay but had a separate ocean outlet and contained a marsh of 2,300 acres. The Santa Ana River flowed into the bay until the flood of 1825 when it changed course. The marsh had extensive freshwater marshes in the interior portion of the bay fed by artesian springs of the Freeman River. Marshes were first part of a sheep and cattle ranch but in 1900 became a gun club. The club constructed a dam to limit tidal flows, created dikes and levees to manage the marsh and connected the bay to Anaheim Bay via a new channel.

Oil was discovered throughout the southeast section of Bolsa Bay in the 1920s. The first well, Bolsa Chica 1, was completed on November 13, 1920, bringing in an initial flow of 2,000 barrels daily. In the 1930s, Signal Oil Company began to slant drill from the Bolsa Chica property in order to tap offshore oil deposits. By 1949, a system of levees, dikes, culverts, and roads were built over much of the area that had previously experienced tidal action. A total of over 400 wells were drilled. During the 1960s, the nearby Bolsa Chica wetlands and the bordering mesas remained undeveloped because of oil production. /139/

In 1973 the state was deeded 327 acres of the wetland and leased 320 acres for 14 years from the area's owners, Signal Landmark, Inc. in exchange for termination of state public trust over the area. The Department of Fish and Game restored tidal action to 150 acres in 1978

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and 275 additional acres of wetland were developed into a housing complex by Signal. Presently 1,200 acres of historic wetlands and restored wetlands remain. Signal plans to develop a residential marina project on a portion of their property, and restore a portion to tidal action. The permit is the subject of current litigation with the California Coastal Commission over the relative acreage and extent of developed and undeveloped portions of the land. /109, 187/

The Santa Ana River mouth was the site of a nearly 3,000-acre salt marsh which was filled in increments from 1950 to 1969 for urban development and a flood control project. Scattered parcels totalling approximately 270 acres of wetland remain. /152a/ The Prado Flood Control Basin in the upper river has developed a stable riparian zone. Riparian forests have largely been lost along the river channel. Additional flood control and marina projects threaten remaining areas.

Newport Bay once contained 13,500 acres of estuary and marsh. The lower bay was dredged during the 1940s to create Newport Harbor. Piecemeal filling around the bay occurred in the 1950s. The Upper Bay was diked off for salt evaporation ponds, but the ponds were destroyed in 1969 by a flood and never re-built. The central portion of the bay was also dredged periodically during the 1950s to maintain a water ski area. This practice was stopped in 1974. /31/

The Upper Bay currently has 912 acres of fresh and salt water marsh and 300 acres of mudflats. Sedimentation from urbanization in the large, 145-square-mile watershed has filled up to 70% of the salt marsh. A maximum of 5 feet of sediment has been accreted on the tidal flats. /111/ The Upper Bay is partly owned (741 acres) by the Department of Fish and Game as an ecological reserve.

Major flood control projects and urbanization on the Los Angeles, San Gabriel, and Santa Ana Rivers removed the majority of riparian vegetation and freshwater habitats on these water courses.

As Los Angeles and Orange County populations continue to increase, so will pressures to develop the remaining private wetlands in these areas. Those marshes which are in state reserves are secure from filling.

However, urbanization of watersheds causes siltation of the wetlands. Continued expansion of port facilities will replace some intertidal lands.

San Diego County

The wetland and riparian resources of San Diego County include several large bays in the southernmost region, a series of coastal lagoons, and several rivers with small estuaries and substantial riparian areas.

San Diego County wetlands remained relatively undeveloped until the early 1900s when the railroad arrived and shipping from San Diego Bay increased. In 1907 the Navy established a base in San Diego Bay and expanded their facilities gradually for 30 years. Water shortages hindered urban growth for a number of years until the Colorado aqueduct became operational in 1941. The boom in growth escalated during the second world war when Naval facilities greatly expanded, industry developed, and the City of San Diego doubled in population. The majority of filling of the bay occurred from 1940 to 1946 and has continued since that time. /13/ The San Diego Port District expanded the port in the 1960s as shipping further increased and the harbor became a major landing point and canning center for tuna. Aerospace, electronics, and other industries located in San Diego during the 1950s and 1970s created employment opportunities and the attendant need for housing and recreational facilities. The County's population has increased by 37% in the past ten years, an addition of 500,000 inhabitants. /147/

The San Diego urban complex extends inland more than 20 miles, with one-third of the population in the coastal portion of the city. /155/ The northern portion of the county has developed more recently, 1960 to 1980, and for many years their economies depended on agriculture and military employment (Camp Pendleton). This northern county is also a tourist and recreational center for the Los Angeles and San Diego metropolitan areas. The wetlands of San Diego County have been lost primarily to port and harbor development for both commercial and recreational uses,

to filling for urban uses, and to highway and railroad crossings. Upstream water impoundments and wastewater discharge have also affected wetland characters. Riparian habitats have decreased with expanding urbanization in the southern county and agriculture in the north.

In the northern county several small creeks (San Mateo [125 acres] and Las Flores) contain riparian and freshwater habitats. The larger Santa Marguerita River mouth contains 800 acres of lagoons and marshes and has a well-developed riparian forest lining much of the water course. /74/ The lagoon extends inland for about one mile and approximately 300 acres in the marsh have been denuded by military operations. /12/ These areas are within the Camp Pendleton Marine Corps Base and consequently not open for development. However, two dams are proposed for construction by the Bureau of Reclamation on the Santa Marguerita River near Fallbrook which could inundate 1,000 acres of riparian lands, with varying effects on downstream areas. /180,147/

The San Luis Rey River contains a significant area of riparian vegetation and a tidal lagoon at the mouth. The wetlands at the mouth were developed into Oceanside Harbor and associated resort facilities in the early 1960s and few are remaining. Brackish marsh covers upstream areas, many of which have been filled for urban uses. /118,176/ A was constructed in the upper watershed in 1923 for flood control.

The Army Corps of Engineers currently has a flood control project pending on the lower San Luis Rey River. Following design review and an extensive public participation program, the Corps is now finalizing designs for a single levee project that would leave one bank of the river unmodified, allowing natural flood flows on this portion. The leveed side would be protected and could be developed. The loss of riparian vegetation, which is typical of most flood control projects, is being partially offset by the nature of the levee design and the dedication of several areas of riparian forest and creation of pond marshes. /173/ A considerable amount of riparian vegetation has already been removed from this water course for development and agriculture. /184,147/

Loma Alta Slough in the City of Oceanside is a small coastal lagoon with 6 to 8 acres remaining of its original 40. /152b/ A recreational vehicle park and emergency holding ponds for the city sewage treatment plants now cover former wetlands.

The next series of wetlands are all lagoons formed at the coastal terminus of various creeks. These are from north to south: Buena Vista Lagoon, Agua Hedionda Lagoon, Batiquitos Lagoon, San Elijo Lagoon, San Diequito Lagoon, and Los Peñasquitos Lagoon. Development on adjacent lands and watershed lands has caused sedimentation in varying degrees in all the lagoons. Some have been filled, and the tidal regime of all has been modified by the construction of the shoreline highway and railroad across the lagoon outlets. Several are next to pending developments. A concise review of each reveals the original size and primary losses or changes.

Buena Vista Lagoon, now a Department of Fish and Game ecological reserve, has 350 acres of wet and submerged lands. Approximately one-third of the lagoon land supports salt marsh. A total of 75 to 100 acres of the lagoon were filled for commercial and residential developments. /34/ Sedimentation in this lagoon has been significant; the DFG is currently suing the responsible upstream land developer to clean out the several feet of silt deposited in the 1979-1980 floods.

Of the 340 acres Aqua Hedionda Lagoon contains, 90 acres of wetland are privately owned by the San Diego Gas and Electric Company. The lagoon has not filled substantially and is used as a water intake point for the adjacent power plant. /6,12/

Batiquitos Lagoon, of 340 acres, is mostly barren salt flats and 100 acres of marshes. Both the railroad and highway pass over the lagoon but little filling has occurred. In 1901, 25 acres of salt marsh were operated, but these were abandoned. Some sediment has accumulated in the lagoon from farming activities in the area which began in 1914. At the anterior end of the lagoon, a delta has increased in size since suburban development began. Upstream and water impoundment have reduced freshwater inflows. /76/ The lagoon is privately owned, with the excep-

tion of the DFG ecological reserve of 135 acres. Consequently, it is under considerable development pressure. /162/

San Elijo Lagoon is a 500-acre water body and marsh which has lost only 10% of its wetlands. The water level is maintained artificially through wastewater discharge, and the DFG maintains a 268-acre ecological reserve on the lagoon. /67/ The California Coastal Conservancy is currently funding and implementing a plan for habitat enhancement in the lagoon wetlands.

San Diequito Lagoon had an extensive 604-acre salt marsh which was reduced primarily through filling. In 1935, a racetrack covered 200 acres and farming operations and other filling further reduced acreage by one-third. Two hundred and sixty-nine acres of marsh surround the lagoon. An upstream impoundment (Lake Hodges) has decreased inflowing water; wastewater has been discharged into the lagoon for 35 years. In addition, the construction of Highway 5 isolated a 300-acre area of the upper marsh. /76/ A marsh restoration program under the sponsorship of the State Coastal Conservancy and the City of Del Mar is underway. The California Department of Fish and Game recently acquired 98 acres of the lagoon.

Los Peñasquitos Lagoon is owned in part by the Department of Parks and Recreation and in part by private interests. It contains 385 acres of tidal wetlands. /75/ Recent development of the watershed has increased sedimentation rates fivefold. /87/ The Coastal Commission, in permitting recent adjacent developments, required the developer to contribute to costs for a restoration plan for the lagoon. Ownership and state acquisition are currently under litigation.

The former wetland acreage of Mission Bay in San Diego is unknown. In 1975, the Army Corps of Engineers diverted the San Diego River away from San Diego Bay and into Mission Bay. The majority of the bay was dredged and filled for an aquatic park with marinas, hotels, restaurants, and beaches. In 1949, the Army Corps completed the San Diego River flood channel which diverted the river water directly into the ocean and relieved sedimentation problems in Mission Bay. A few wetlands remain at Famosa Slough (25 acres), Kendall-Frost Mission Bay Marsh, and at the

mouth of the river channel. However, most of the former estimated 4,500 acres is developed and the City of San Diego owns the bay. /112/ The Coastal Conservancy funded a restoration project for the Famosa Slough. Riparian zones along the San Diego River in Mission Valley are currently threatened with commercial development. Historic sand mining lowered the river bottom elevation closer to the groundwater table and induced riparian forest growth. Recent urbanization of this area has put extreme pressure on these resources. /162/

San Diego Bay constitutes the largest estuary along the San Diego coastline and has been extensively developed as a port. The bay is crescent-shaped, stretching for 14 miles along the coast. Formerly, the San Diego River (rerouted in 1849), Sweetwater, and Otay Rivers flowed into the bay. Ninety percent of the original salt marshes and 50% of the original mudflats have been filled or dredged for port and urban development. /13/

The Spanish established their first settlement in California along the shores of San Diego Bay on the present city site. Grey whales formerly used the bay as a calving lagoon, and extensive marsh lines the shore and river deltas. In 1830, a whale industry developed which died out by the 1880s. The bay is a natural harbor and port; its development began in the late 1800s. In the early 1900s the Navy began developing harbor facilities and greatly expanded the harbor's operations in the 1940s. Between 1940 and 1946, 25 million cubic yards of sediment were dredged from the bay and used to fill tidelands. Salt evaporator ponds were created in the southern portion of the bay. The commercial tuna fleet was harbored in the bay and delivered directly to canning industries located along the bayfront. The San Diego Unified Port District, founded in 1962, made a substantial increase in wharves. Shipbuilding and repair became a major industry in the bay. The harbor is also a major naval establishment, supporting more than 18% of the fleet and acting as a training storage area. In 1971, naval spending contributed 1.2 billion to the San Diego region's economy. /13,114/

Remaining wetland habitats are concentrated in the southern bay at the river deltas and southern shoreline. These total approximately 1,400 acres of salt ponds, 359 acres of marsh, and 614 acres of mudflats. The wetlands are in various city and private ownership with the Port District and Navy owning the majority of the bay /86/ and have a number of projects planned for them, including filling for urban and port development, maintenance dredging, highway construction, and recreational harbor creation. /162/ In addition, a flood control project is planned for the Sweetwater River. The Port District is creating a 90- to 100-acre marshland island from dredge spoils in the southern portion of the bay. /103/

Tijuana River estuary covers about 1,182 acres and represents 10% of the remaining estuarine habitat in California. /113/ Little filling has occurred, and in 1981 the Fish and Wildlife Service acquired the area as an estuarine sanctuary through the federal Office of Coastal Zone Management and manages the area as wildlife refuge. The local jurisdiction, City of Imperial Beach, had wanted to develop a marina. Activities in the watershed and illegal filling continue to affect the wetlands. /154/

Vernal pools, small isolated depressions which seasonally fill with water, are another wetland type found in San Diego County. They are distributed over the mesa tops which separate watersheds in the northern and central areas of the county, and many host an endangered plant species. Filling and agricultural practices have reduced their acreage significantly (90%). /172/

San Diego County is the fastest growing county in the state, with a 2.2 annual increase in population expected in 1980-1985. /99/ This population growth will continue to place development pressure on coastal watersheds and wetlands.

Overall, the coastal wetlands of southern California have experienced a drastic 75% reduction. Of the 28 original estuaries along the coast, 15 have been modified slightly, 10 have been greatly altered, and 3 have been destroyed. There are now 31,700 acres of estuarine habitat; less than 13,100 is marshland and tidal flats, and 18,600 is open water. /133/

Often the large bays fostered the early growth of cities as at San Pedro and San Diego Bay. The natural aquatic qualities lent themselves to port development; the major harbors - Los Angeles/Long Beach and San Diego - became shipping and fishing centers. The growth of the port was matched on shore with the proliferation of canneries and industrial complexes. Other harbors, carved out of marshes, had recreation and residence as their purpose. Marina del Rey, Mission Bay, Oceanside and Huntington Harbor are examples.

A great majority of the wetlands and especially riparian areas were lost to filling and flood control projects for urban development. The areas that remain are largely in regions of moderate-to-low population, state or federal refuges or military ownership, or were previously oil fields. Those privately-owned wetlands which exist in urban centers experience extreme development pressure as populations continue to increase (e.g., Bolsa Chica, Ballona). These pressures continue on wetlands, and especially riparian areas, as predicted population increases create demands for urban lands. However, the demand for open space and recreational areas is also expanding, and coastal areas are highly desirable for this use.

Two results of wetland losses and removal of riparian vegetation are particularly evident: 1) the habitat of water-associated wildlife has been dramatically reduced; and 2) the natural flow characteristics and channel geometry of coastal streams has been largely replaced. The coastal marshes are a link in the Pacific Flyway for both waterfowl and migratory shorebirds. As the capacity of wetland areas has declined in area, waterfowl populations have decreased correspondingly statewide. South Coast marshes act as wintering habitat, which is presently a limiting link to increased waterfowl populations. Particular wetlands continue to be of significance to both waterfowl and shorebirds. /140/ These are listed below with corresponding use figures, where known.

| Area | Waterfowl/Shorebird Average Animal Use Days |
|---|---|
| Morro Bay Lakes | 1.833 million waterfowl |
| Dunes Complex | 1.55 million shorebirds |
| Santa Maria River mouth | 250,000 shorebirds |
| | 21,000 waterfowl |
| Goleta Slough | 150,000 waterfowl |
| Carpinteria Marsh | 194,000 shorebirds |
| | 61,000 waterfowl |
| Mugu Lagoon | 314,000 waterfowl |
| Anaheim Bay | 784,000 waterfowl |
| Bolsa Chica | 200,000 waterfowl |
| Upper Newport Bay | 1,000,000 waterfowl |
| Santa Marguerita River mouth | 500,000 waterfowl |
| Buena Vista Lagoon | 70,000 birds observed at one time |
| Batiquitos Lagoon | 550,000 " " " " " |
| San Diequito Lagoon | 120,000 |
| Los Penasquitos Lagoon | 215,000 |
| San Elijo Lagoon | 400,000 |
| South San Diego Bay | 2.7 million |

The light footed clapper rail is federally listed as endangered due to wetlands habitat loss. Belding's savannah sparrow is listed as endangered by the state. Those wetlands with the highest number of clapper rails are Tijuana Estuary, Mission Bay Marshes, Upper Newport Bay, Anaheim Bay and Carpinteria Marsh. /148/ Salt marsh bird's beak (*Cordylanthus maritimus* ssp. *maritimus*) is a federally listed, endangered plant species of coastal salt marshes. Another federally listed, endangered species, the California least tern, relies on tidal areas to feed. Bell's vireo, a riparian resident bird species, is an endangered species in Southern California. Morro Bay Kangaroo Rat inhabitats a small area of sandy soil along the south shore of Morro Bay adjacent to wetlands.

Removal of riparian vegetation for any number of reasons has also caused some impact on flood control in downstream areas. As upper areas

are denuded and riprapped or otherwise armoured, flood water velocities increase, causing downstream erosion and need for further revetment and repair. Processes along the Santa Ana River exemplify this problem. /209/

Channelization of rivers, combined with the filling of wetlands and water quality problems, have reduced, and in some cases (Los Angeles River) obliterated, fisheries. /209/ The Santa Marguerita River had a steelhead fishery at one time. /194/ Lining of river channels and development of flood plains has also reduced the groundwater recharge capacity of the river gravels and may aggravate aquifer drawdown and salinity intrusion in the Los Angeles area.

EVALUATION OF FACTORS

The economy of Southern California is diverse and not totally reliant on water-related industry or wetland-dependent developments. Port development, urban growth, and oil exploration have all contributed to wetland losses. Starting in the Los Angeles area, urban expansion began in the 1920s and by the 1950s and 1960s had spread out over much of Orange County. San Diego developed as a separate population center, experiencing a similar boom in the 1950s-1970s period. Table 12 lists population increases in the entire Southern California region. Although these population increases do not reflect coastal growth specifically, they do illustrate the general trend of massive population increases, with the associated housing, commercial, and recreational demands. Real estate in coastal areas is generally worth more than interior areas; consequently, undeveloped coastal lands are rare and a much more profitable investment than land in other regions. /209/

Recreational marinas, harbors and shoreline facilities are also in demand. Marina Del Rey is an example of a residential marina built to accommodate water-oriented recreation. Private boat slips are limited and new marinas are consistently proposed along the coast. /162/

The Los Angeles/Long Beach Harbor is a major port which ranks first in tonnage on the Pacific Coast. Petroleum makes up a large percentage

TABLE 13

POPULATION TRENDS

SIX SOUTHERN CALIFORNIA COUNTIES

| County | 4-1-50 | 4-1-60 | 4-1-70 | 4-1-80 |
|---|---|---|---|---|
| Los Angeles | 4,151.687 | 6,038,771 | 7,041,980 | 7,477,657 |
| Orange | 216,224 | 703,925 | 1,421,233 | 1,931,570 |
| San Diego | 556,808 | 1,033,011 | 1,357,854 | 1,861,846 |
| San Luis Obispo | 51,417 | 81,044 | 105,690 | 155,345 |
| Santa Barbara | 98,220 | 168,962 | 264,324 | 298,660 |
| Ventura | 114,647 | 199,138 | 378,497 | 529,899 |
| 6 Coastal California Counties | 5,189,003 | 8,224,851 | 10,569,578 | 12,254,977 |
| California | 10,586,223 | 15,717,204 | 19,971,069 | 23,668,562 |

PERCENTAGE INCREASES IN SOUTHERN CALIFORNIA POPULATIONS*

| | Nine Southern California Counties | California | United States |
|---|---|---|---|
| 1910-1920 | 77.6 | 44.1 | 14.9 |
| 1920-1930 | 116.4 | 65.7 | 16.1 |
| 1930-1940 | 25.1 | 21.7 | 7.2 |
| 1940-1950 | 53.9 | 53.3 | 14.5 |
| 1950-1960 | 59.7 | 48.5 | 19.0 |
| 1960-1970 | 29.4 | 27.1 | 13.3 |
| 1970-1980 | 18.0 | 18.5 | 11.4 |

*Includes six coastal counties as well as Imperial, Riverside and San Bernardo counties.

Source: Bureau of the Census, U.S. Department of Commerce

of shipments, and increasing demands for new berths has led to a proposal for a new 600-acre fill and development project.

San Diego, a combined naval and commercial harbor, has not expanded in several years. The San Diego economy at one time relied on the naval and shipping industries but has diversified into other, non-water dependent fields. The San Diego Port District does, however, have plans for increasing their harbor size and shoreline facilities to accommodate increasing demands. /86/ Local jurisdictions, such as Chula Vista, have proposed marinas in several wetland areas.

The commercial fishing industry, centered at Morro Bay, San Pedro and San Diego, harvests ocean species such as tuna primarily. The harbor development in these two areas greatly accelerated the industry's success in the 1930s. Over the years, their continued prosperity has roller-coastered, with variable catches and markets. At present there appears to be an increased demand for boat berths.

Sport fishing party boat demand has also increased and small harbor construction has reflected this trend at Morro Bay, Oceanside and other areas. Oyster mariculture is practiced in Morro Bay. Although using tidal wetlands, this industry does not necessarily alter them. Between 1966 to 1970 these beds produced 3% of the oysters consumed in California. /36/

Tourism plays a leading role in both coastal development and coastal preservation. Visitor facilities and convention centers have been built along the scenic coastline in San Diego, Los Angeles and Orange Counties often to the detriment of wetlands. In other areas, such as Morro Bay and the Santa Barbara Coast, the preservation of tidal lands draws visitors.

Technological trends and engineering techniques have accelerated wetlands loss but not specifically fostered it. Improved dredging technology and engineering of filled lands, the increased ability to control water through upstream impoundments and flood control channels have all contributed to the ease with which tidal and riparian habitats

can be displaced. In one case in San Diego Bay, technology is being applied to the creation of a tideland with dredge spoils.

Changes in farming practices and widespread use of more efficient machinery has led to increased sedimentation rates in the northern county areas. Grading for construction with heavy machinery has caused widespread and extensive erosion in the watersheds of the southern counties with consequent siltation of remaining tidal areas.

Physical factors which have affected wetlands loss largely result from these technological advancements. The factors include: downstream water losses through impoundments and diversions, increased rates of sedimentation and stormwater runoff velocities due to impervious urban surfaces, highway and railway berms blocking tidal inflows to wetlands, flood control channels which direct flood waters directly into the ocean, thus reducing retainment time in coastal lagoons or marshes. These factors are documented on a case-by-case basis along the South Coast.

Social factors affecting wetlands may be described by several elements: the number of private organizations centered around wetland preservation; major voter mandates concerning coastal development; visitor use of refuges and parks containing tidelands, and coalitions of developers opposing regulation of coastal areas. The discrete and variable distribution of Southern California coastal wetlands has fostered the growth of a number of conservation groups, each primarily concerned with the future of one single lagoon or bay or portion of either. Their membership varies in size (e.g., Amigos de Bolsa Chica has 1,000 members) and many have had a great effect in influencing preservation of specific wetlands (e.g., Torrey Pines Protective Association, Friends of Madrona Marsh). /156,162/ Almost every major wetland along the South Coast, and many rivers with riparian areas, now have a corresponding conservation interest. This heightened interest in wetlands reflects local concern for the welfare of these areas; some members have been involved for 10-15 years in their organizations. /156,162/

In addition to these smaller, specialized groups, a number of larger organizations watchdog wetland developments. These include the Sierra Club, Friends of the Earth, Audubon Society, Oceanic Society, League of Women Voters, California Native Plant Society and others.

Scientific organizations and researchers have also demonstrated an increased interest in wetland study. Several major universities have ongoing wetland and riparian studies, and the State Sea Grant program has completed several publications specific to coastal wetlands.

From a different perspective, several organizations have developed in response to coastal regulations which control development, such as California Council for Environmental and Economic Balance and Alliance for Coastal Management. Their interests lie more generally in economic development of the coast, including wetland areas. The main target of these organizations is the California Coastal Commission, which is more rigorous in regulation of wetlands than the Corps along the South Coast.

Despite the profusion of conservation organizations, their overall membership is very small in proportion to the region's population. The vast majority of residents of the Los Angeles area have not been characterized as conservation-oriented by many observers /162,176,209, 156/ No opinion polls or studies can substantiate this observation; it is the impression of residents involved in wetlands issues.

The Coastal Initiative passed by the California voters in 1972 was a public response to degradation and development of coastal resources. While not specifically aimed at wetlands protection, this initiative demonstrated a statewide concern for the coast and limitation of its development. The developers and landowners themselves have continued to oppose a major part of the state's program.

Several wetlands parks and reserves dot the south coastline, and many are open to public use. Morro Bay State Park received an average of 1,300,000 visitors annually from 1967-1971. Pismo Dunes State Park is also popular, but visitor numbers largely reflect ORV use of the dunes

area. /192/ Seal Beach National Wildlife Refuge, because of its proximity to the Naval Weapons Center, is not open to the public. The state ecological reserves at Upper Newport Bay and Buena Vista Lagoon, while admitting visitors, do not keep records. Tijuana River National Wildlife Refuge has just been founded and no use records are available. Environmental education programs are available at many of these areas.

In summary, the greatest factor which has affected and continues to affect wetland and riparian areas along the south coast is land economics. As demands for urban lands rise, concurrent with population increase, wetlands and riparian zones are under greater pressure for development. High shoreline real estate values induce an even greater demand for development here. Sedimentation of wetlands is aggravated by this increased development in surrounding watersheds. Growth in industrial sectors spurs port development and vice versa, further encroaching on available wetland and subtidal areas. Countering this trend is a small but active proportion of citizens concerned with wetland and riparian preservation.

## DESERT REGION

### HISTORY OF WETLANDS AND RIPARIAN FORESTS

The California Desert region encompasses a large geographic area as well as sections of the three major, distinct desert systems in California: the Great Basin, the Mojave, and the Colorado (Sonoran). The wetland and riparian areas of each desert vary in vegetative composition, size, and abundance. Generally, these habitats are concentrated along perennial streams, springs, lakes, and washes. The rarity of this vegetation type over the entire desert region makes each grove and spring of significance to wildlife.

Natural boundaries have separated the Mojave and Colorado Deserts, and each has evolved riparian and wetland resources which are scattered over a large land area. The Colorado River, although a part of the Colorado Desert, is a unique hydrographic feature with particular riparian characters. In addition, the man-influenced formation of the Salton Sea created a large water body distinct from its surrounding landscape. Consequently, we have divided this region into three units: the large Mojave and upper Colorado Deserts, the Colorado River, and the Salton Sea and its adjacent wetlands.

#### Mojave and Colorado Deserts

Bounded on the west by the Sierra Nevada and on the south and east by Tehachapi and San Gabriel and other ranges, the Mojave Desert includes one-sixth of California's land area. The Colorado Desert includes the desert sinks and mountains south of these ranges and stretches into Mexico and east into Arizona. The Colorado River forms the eastern boundary and the international border the southern boundary of the California portion of this desert.

Desert riparian groves are composed of cottonwoods (*Populus fremontii*) and willows (*Salix* sp.) along primary water courses, and cheesebush (*Hymenoclea salsola*), saltbush (*Atriplex* sp.), rabbit bush (*Chrysothamnus*

*paniculatus*), and catclaw (*Acacia greggii*) along seasonal washes and drier stream beds. Springs sponsor growth of willow (*Salix* sp.), screwbean mesquite, and common reed (*Phragmites communalis*). Generally, riparian areas are poorly developed and greatly limited in extent, giving them all the more significance to wildlife. /168,143/ Alkali sinks with some seasonal water or a high groundwater table support halophytic species such as salt grass (*Distichlis spicata*), and pickleweed (*Allenrolfea occidentalis*). /90/ Palm oases dominated by the Washington palm (*Washingtonia filifera*) are limited in distribution within the Colorado Desert only. /129/

The greatest concentrations of riparian vegetation lie along larger streams of the moister mountain ranges including: the eastern Sierra slope, Inyo Mountains, Panamint Range, Argus Mountains, Santa Rosa Mountains, and the New York-Providence Mountains. Major rivers such as the Amargosa, Mojave, Whitewater, New, and Alamo are bordered with riparian groves. /68/ Springs and washes exist throughout the desert mountains and vary in size. Freshwater marshes are quite rare; Harper Dry Lake in the northern Mojave and San Sebastian Marsh on San Felipe Creek are the only freshwater marshes of relatively large size.

The importance of desert riparian areas to wildlife is expressed through their use by bird species. In the Mojave Desert, 76% of all bird species use riparian areas for some portion of their life history. Twelve species nest exclusively in this habitat. By comparison in the Colorado Desert (not limited to California) 18% of all species are dependent on riparian areas to breed, and 82% use these habitats to some degree. /83/

The scattered and varying nature of wetlands in the desert makes acreage estimates difficult. At present, there appear to be no reliable data on desert wetland and riparian acreages. Nor is information on previous wetland distribution and losses in the desert area available.

Water, the determining factor to all wetland and riparian plant growth, is also the all-important requirement to most other desert land uses. This multiple demand for such a limited resource often puts wetland areas in direct conflict with mining operations, recreational uses, agriculture, and grazing by both feral and domestic animals. /168, 163/

The most significant of these conflicting uses in the desert region is surface mining operations with their demands for water and severity of land disruption. Within the California Desert Conservation Area (which roughly encompasses our defined desert region), the Bureau of Land Management (BLM) estimates that there are 360 approved mining operations on public lands. Of these, 10-15% are impacting a riparian area either by direct mining in riparian zones or by road building. /163/ These mining operations are primarily small, two to five-acre, gold mines which are concentrated in the Inyo, Argus and Panamint Ranges of the northern Mojave Desert. Although direct removal of two to five acres of vegetation for mining may seem a small impact, the limitations and disparity of the riparian resource make each loss a significant one, especially in areas of highly isolated groves. Wildlife dependent upon an individual spring or water source or the nesting habitat of a riparian forest may not be able to relocate to the next nearest grove. /168/ Neither the cumulative nor individual effect of these losses has been quantitatively studied.

Herds of feral burros, largely concentrated in the northern Mojave area, also depend on springs and riparian areas for water and foliage. A total of 10,200 burros inhabit the northern and eastern Mojave and the Colorado River valley. Large herds of 50 to 75 individuals can trample both the vegetation and soils of a spring and pollute water sources, leaving the site unusable for other wildlife. /168/ Recreationists, fond of water and shade, often camp near desert springs and rivers. Cutting of wood for fires, littering, and overuse damage the riparian groves.

Grazing by domestic livestock has a combination of effects in different desert areas. Grazing of riparian vegetation seedlings denudes

these areas and, if overused, the riparian vegetation cannot sustain itself. Overgrazing of desert watersheds, combined with removal of stream and wash vegetation, causes erosion and entrenchment of downstream water courses. Groundwater pumping has had or threatens to affect wetlands in a few isolated localities. For example, a jojoba ranch proposed for private lands adjacent to the San Sebastian Marsh would pump wells for irrigation and could affect the marsh by lowering groundwater levels. /168/

Current planning efforts by the BLM in the California Desert Conservation Area (CDCA) have identified many of the wetland and riparian resources as Areas of Critical Environmental Concern (ACEC), wilderness areas, and habitat management areas. The BLM, however, does not own all of the California desert lands and has limited management control over private lands. BLM and the military are primary landowners in the California desert; their jurisdiction and planning efforts in regard to wetlands and riparian areas are discussed in the Evaluation and Regulatory Overview Chapters.

Colorado River

The Colorado River forms the 250-mile-long, jagged border of southeastern California. The lower reaches of this extensive river system once contained large areas of riparian forest and several marshlands. The meandering river channel, with its continual transport and deposition of sediments, created backwater areas and isolated "ox-bow" lakes. These wetlands were historically short-lived, lasting 50 to 75 years, as the river transformed and scoured at flood stage and redeposited along another floodplain. These marshy backwaters are usually filled with cattails (*Typha domingensis*), bulrush (*Scirpus* spp.), and pond weeds (*Potomogeton* spp.), although riparian tree species, cottonwood, willow, and honey mesquite, also invade peripheral marsh areas.

The extensive riparian forests along the river contained several zones of vegetation coinciding with the incidence and extent of flooding,

the groundwater table, and the deposition of new sediment. Willows (*Salix gooddingii*) and cottonwoods (*Populus fremontii*) formed a thick and mature forest on the primary floodplain, rapidly colonizing new alluvial plains. Arrowweed (*Tessaria sericea*) grows slightly farther away from the river channel. The next higher corridor contains screwbeam mesquite (*Prosopis pubescens*) and quailbush (*Atriplex lentiformes*). A second terrace of riparian vegetation contains less hydrophylic vegetation, including honey mesquite (*Prosopis glandulosa*) and velvet mesquite (*Prosopis velutina*) in thick, extensive forests. Creosote bush (*Garrea divaricata*), saltbush (*Atriplex* spp.), and blue palo verde (*Cericidium floridum*) occupied even drier, more distant areas of the floodplain. /83/

The history of appearance and loss of backwater marshes and riparian zones is limited and short, spanning American exploration and development of the Colorado River. Most data are not confined to the California side of the river, but include the lower Colorado as a whole. In addition, development and land uses along the river relate to the southwestern region, not strictly to California.

Historical accounts describe ox-bow lakes and backwater swamps along many stretches of the lower Colorado, specifically in the Mohave, Palo Verde, Cibola, and Yuma Valleys. They varied in size from 32 acres to 1,314 acres and formed in periodically flooded areas. /81/ During a 1910 survey, Grinell described these areas:

> "The river's habit of overflow would be expected to result in rather extensive tracks of palustrine flora. As a matter of fact, however, marshes were few and of small size. This was probably due to the rapid rate of evaporation of overflow water so that favoring conditions did not last long, and also to the rapid silting-in of such water basins as ox-bow cutoffs. As a result there were either almost lifeless alkali depressions, or lagoons practically identical in biotic features with the main river. But in a few places there were well-defined paulstrine tracts kept wet throughout the year, chiefly by seepage. These were always located back from the river near the outer edges of the broader valleys, where they were least affected during flood time. They were marked by growths of tules, sedge, and saltgrass, sometimes the latter alone, and were usually surrounded by arrowweed or willow association." /81/

For example, in 1910 Lake Su-ta-nah, Duck Lake, and Powell Slough existed in the Mohave Valley between Needles, California, and Topock, Arizona. They were 121 acres, 420 acres, and 234 acres, respectively, and located one to three miles distant from the main river channel. Their orientation parallel to the channel indicates they were scoured by the river during flood stages and abandoned at low water. The rising waters of Lake Havasu inundated these areas in 1938.

Riparian vegetation was more abundant along the river than marshland. Various studies, based on historic surveys, estimate up to 70% of the lower Colorado floodplain was covered with riparian forests. Cottonwood forest, specifically, along 200 miles of lower Colorado may have totalled 5,000 acres. Between the Parker and Palo Verde Dams (near Blythe) lie 108,000 acres of floodplain, of which 71,000 acres supported riparian species. /116/

The great fluctuations in the river flow both flooded and destroyed riparian forests and wetlands as in 1905-1907, and drought dried them as during 1855-1890. American exploration and use of the Colordo began in the 1800s with the river serving as a major transportation route for the southwest. Steamboat transport on the lower river necessitated cutting of the virgin cottonwood gallery forest for steampower. Large areas of cottonwood were completely cut during this early period. Clearing of mesquite for agriculture and grazing of livestock along the floodplain somewhat reduced secondary riparian forests. /84/ However, the development and control of the Colorado River and its water has had the greatest effect upon wetlands and riparian areas.

Major flood control projects entailing riprap and levee building along the river banks began in 1920 and still continue. Between 1906 and 1924, $10.25 million were spent for levee construction and maintenance on the lower Colorado, primarily to protect developments on floodplains and adjacent farmlands. In 1946, the Bureau of Reclamation under the Colorado River Front Work and Levee System Act began channelizing the

stream bed for flood control purposes. In 1949, the dredger, "The Colorado," began work, dredging the channel between Needles and Topock; two other dredgers began work in the following years. Table 13 lists channel modifications within the ten operational diversions along the lower Colorado. The channelization and dredging of the river eliminated existing backwater marshes through filling and isolation from water supply, and bank armor (riprap) replaced riparian vegetation; post-construction condition and maintenance activities largely precluded reestablishment of vegetation. /141/

The construction of the large dams on the Colorado and regulation of water and sediment movement has had various effects on the riparian and wetland areas. Five dams and their impoundments occur on the California portion of the Colorado. Beginning in the north they are: Parker Dam and Lake Havasu, Headgate Rock Dam, Palo Verde Dam, Imperial Dam, and Laguna Dam. Many backwater marshlands were flooded behind dams or left dry as overflows out of the main river channel were controlled; few historic backwater areas remain. However, as sediment-laden flood waters enter the large reservoirs such as Lake Havasu, the silt out, forming deltas which eventually develop as marshes. At Blackenship Bend on Lake Havasu, nearly 123 acres of freshwater marsh has formed in 20 years. Recent river channel projects have incorporated designs for artificial backwaters and restoration of degraded areas such as Topock Marsh. /81/

Connected with control of the river's floods and creation of a stable source of irrigation water, the floodplains surrounding the Colorado have been cleared of riparian vegetation for agriculture. The dams stopped the seasonal flooding and silt deposition of the river, eliminating new alluvial plains for primary cottonwood establishment. In addition, the introduction of salt cedar (*Tamarix chinensis*) in the 1800s from Europe brought a hardy riparian species into the Colorado which now successfully outcompetes cottonwood seedlings. This tree spread rapidly in the 1930s and 1940s. Along with the physical changes in hydrologic

TABLE 14

RIVER-MILE DESIGNATIONS, LENGTHS, AND ESTIMATED PERCENTAGES OF BANK MODIFICATIONS THROUGH RIP-RAP, OR OTHER ARMORING TECHNIQUES, OR INUNDATION, FOR 10 OPERATIONAL DIVISIONS ON THE LOWER COLORADO RIVER, 1973.

| Divisions | River Miles (old system) | Length in km | Percentage Modified |
|---|---|---|---|
| Mohave Valley (MO) | 422.0-464.0 | 67.6 | 65.4 |
| Topock Gorge (TO) | 464.0-478.0 | 22.5 | 0.0 |
| Havasu (HA) | 478.0-524.5 | 74.8 | 100.0 |
| Parker (PA 1/ | 524.5-568.8 | 71.3 | 23.0 |
| Parker-I | ---- | ---- | 50.0+ |
| Parker-II | ---- | ---- | 4.0 |
| Palo Verde (PV) | 568.8-596.6 | 44.7 | 58.0 |
| Cibola (CI) | 596.6-619.9 | 37.5 | 86.0 |
| Imperial (IM) | 619.9-657.2 | 60.0 | 35.0 |
| Laguna (LA) | 657.2-662.6 | 8.7 | 100.0 |
| Yuma (YU) | 662.6-683.7 | 33.9 | 90.0 |
| Limitrophe (LI) | 683.7-704.2 | 33.0 | 6.0 |

1/ Parker Division is divided into a modified reach (Parker-I) and a relatively unmodified reach (Parker-II).

SOURCE: Minckley, W.L. 1979. Aquatic habitats and fishes of the lower Colorado River, southwestern United States. Report for Water and Power Resource Service (Bureau of Reclamation), Boulder City.

and sediment regime on the river and grazing pressures, salt cedar has been responsible for replacement of the cottonwoods. The remains of cottonwood forest are now isolated trees or sparse rows intermixed with willow. Less than 500 acres of pure stands of cottonwood and only 2,800 acres of mixed cottonwood and willow now exist on the lower Colorado River. /82/

The loss of wetland and riparian vegetation has had an adverse effect on both bird and aquatic species. Two rare and endangered species, Yuma clapper rail and black rail, nest in backwater marshes. Migratory birds such as great blue heron, least bittern, American bittern, and several others also nest and feed in these marshes. Both adult and juvenile fish species, including three endangered native fish species (Colrado squawfish, bonytail and humpback sucker) and common introduced species, feed in the backwaters. /16/ Unchannelized reaches and marshy areas have greater numbers of fish than modified channels. /14/ Bird species, particularly passerines, that nest in the riparian habitats have been reduced in numbers.

Habitat restoration and preservation activities have been limited along the river; present efforts include revegetation of 25 acres of dredge spoil, acquisition by Fish and Wildlife Service of 700 to 800 acres of cottonwood forest in Havasu National Wildlife Refuge, and creation by Bureau of Reclamation of backwater marshes near levee and dredge projects. Two other national wildlife refuges, Cibola and Imperial, preserve some wetland and riparian habitats along the river.

Continued manipulation of the water regime, dredge and levee projects will cause additional losses of wetland and riparian habitats along the river unless mitigated. The majority of the unmodified reaches of the river are now within National Wildlife Refuges or Indian reservation holdings. At the same time, the need for river channel projects has been decreasing in recent years. /203/ Ever-increasing water and power demands of southwestern cities and agriculture has precipitated plans for changing the management and release of Colorado water between the series

of dams. Exact details and effects of these proposed changes on wetland habitats are not presently known. /191,190/

Salton Sea

The Salton Sea was a perennially dry lake bed during most of the 1800s. The Salton Sink, which now holds the sea, was irrigated by water delivered via the All-American Canal from the Colorado River; by 1904, 75,000 acres of desert land were under irrigation and producing crops. The Colorado River in 1905 reached an extreme flood stage. In keeping with its past habits of migrating channel alignments, the river flooded into the sink through the channel of the canal. The entire flow of the river entered the valley for 16 months, transforming the Salton Sink and the irrigated farms into the present Salton Sea. In 1907, the river was returned back to its original course, leaving behind a sea 76 feet deep and 488 square miles in area. /141,116/

Since the time of its formation, the level of the Salton Sea has fluctuated. Between 1907 and 1935, the sea level fell. From 1935 to 1979 the level of the sea then rose approximately 17 feet as the inflow of agricultural draining water from the Imperial Valley exceeded the outflow. The original acreage of wetlands which developed around the Salton Sea beginning in 1907 has changed as the sea level has fluctuated. With continuing net increase in sea level, many wetland areas have been inundated. Previous agricultural development of lands bordering the evolving new shoreline has limited continuous natural development of new marshes in these same shoreline areas. Presently, the wetlands that do exist lie along the southern shore adjacent to and covering the deltas of the New and Alamo Rivers. The delta of the Whitewater River along the northwest shore and Salt Creek on the eastern side contain marshland. Vegetation in these freshwater wetlands consists of tules (*Scirpus* spp.), sedges (*Juncus* spp.) and cattails (*Typha* spp.). Many are managed for waterfowl habitat. /146/ There are also some mudflats in the delta and shoreline areas.

The Salton Sea National Wildlife Refuge, established in 1930, encompassed 35,000 acres, which were subsequently inundated. Imperial Irrigation District leased another 24,000 acres to the U. S. Fish and Wildlife Service of this area 1,565 acres remain above water. Approximately 800 acres are managed marsh and open water for waterfowl, and 700 acres are alfalfa and rye grass fields.

The California Department of Fish and Game maintains several wetland areas: the 535-acre Hazard Tract, and the Wister Waterfowl Management Area of 5,255 acres. The Wister reserve contains grain pastures, open water, and marshland. In addition, the Department of Fish and Game manages the 2,600-acre Finney-Ramer Wildlife Area southeast of the sea on the Alamo River. Approximately 50 private duck clubs of unknown acreage are concentrated along the southern shore.

The marshes and river area also support populations of several rare and endangered species: the Yuma clapper rail and California clapper rail. Waterfowl use of the Salton Sea is great: 12,000 to 20,000 snow geese, 5,000 great basin Canadian geese, and hundreds of thousands of ducks annually migrate to the sea.

The New, Alamo, and Whitewater Rivers have riparian forests of significant size lining their banks. These desert riparian woodlands of salt cedar, common reed, and arrowweed are inhabited by many types of wildlife and act as migration corridors to waterfowl and bird species moving between the sea and river areas. /146/

There are several current threats to the wetland and riparian resources of the Salton Sea area. The increase in the sea level has inundated wetland areas and could continue to flood remaining marshes. Other alternative management systems for irrigation return water could offset the increased water levels.

Geothermal facilities have been proposed in the southern shore in close proximity to the wildlife refuges. If constructed, these facilities would require 900 acres of land and some habitat areas, and possibly create

water quality problems and disturb wildlife in both marsh and riparian areas. In addition, the New and Alamo Rivers could become sources of cooling water for geothermal plants; such a change in water regime may reduce riparian growth. /146/

A channel was dredged through the Whitewater River delta in 1978 by the Coachella Water District in order to speed runoff into the Sea from the delta. The marshland vegetation in this area was removed during the dredging operation. /164/ This wetland is habitat for the endangered Yuma clapper rail.

EVALUATION OF FACTORS

The development and settlement of the desert brought a diverse, scattered economic base to the region. Much of the 25 million acres of the California Desert area is in government holdings. These include 12,131,000 acres administed by BLM, 3,172,000 acres by military, and 2,497,000 acres as national monuments. An additional 885,000 acres are owned by the state. /143/ Historically, land uses largely reflected the limited natural resources of the desert and centered in livestock grazing and mining.

The activities of grazing and mining are widespread over the desert landscape but do not primarily affect wetlands. However, the arid climate of this region has always made water resources central to any endeavor, putting some mining and grazing activities in conflict with preservation of riparian and wetlands vegetation. Approximately 4.5 million acres in the CDCA are under grazing allotments, and livestock use of the region is declining. Development of springs in connection with grazing usually is accompanied by some loss of vegetation, since livestock occasionally graze riparian vegetation.

Mining includes minerals such as borax, potash, soda ash, lithium from dry lake beds and stone and gravel from quarries, as well as many important and precious minerals from mountain and valley mines. Forty-

six different minerals occur in the CDCA, and over 50% of the minerals produced in California come from this area. The BLM estimates that a total of 34,000 acres of land have been disturbed through present and historic mining activities; they expect 25,000 additional acres to be excavated on BLM lands. Riparian areas constitute a small percentage of these totals. Disruption of significant riparian areas is now reviewed under new federal regulations regarding surface mining.

Agricultural development of desert valleys began in the 1900s and expanded after 1938 with the construction of dams and reservoirs on the Colorado River. This development indirectly resulted in the loss of riparian and wetland areas throughout the lower Colorado area. Farms in Imperial, Coachella, and Palo Verde Valleys are irrigated by Colorado River water (approximately 675,000 acres) and produce a variety of crops. Imperial Valley produces citrus fruits and many types of vegetables, cotton, hay, wheat and lettuce, and ranks fourth as an agricultural producer in the state. The Palo Verde and Coachella Valleys supply citrus, vegetables, milk, and eggs to nearby Los Angeles. /144/

Colorado River water supplies many of the urban areas of Los Angeles and San Diego and has been largely responsible for accommodating the massive population growth in these areas since the construction of the Colorado aqueduct in 1941. Over half of the water used in southern California is supplied by the Colorado River. The 1940-1970 era saw the population of the City of Los Angeles double and the four southern California coastal counties triple. /80/ The western fringes of the desert in the Coachella and Antelope Valleys and Palm Springs have also experienced urban growth. /55/

Recreational use of the desert has increased and brought tourist industries to some areas. Approximately 44% of all desert workers are employed in these service industries. The CDCA hosts 16 million visitor use-days per year. Most recreational uses remain primitive in the undeveloped reaches, and visitors usually camp along watercourses and at

springs. Off-road vehicles travel down washes, crushing sparse riparian vegetation. As with many of the other uses of the desert lands, the direct relationship of recreation to riparian and wetland areas is not documented.

Technological advancements in water diversion and impoundment facilities made possible the construction of dams and canals in the 1930s. Earlier attempts were largely unsuccessful, evidenced by the overflow and siltation problems in the Salton Sea flood in 1905. The delivery of Colorado River water to urban southern California and agricultural lands is enabled by a complex system of open canals and closed aqueducts. The Colorado aqueduct, for example, tunnels through several mountain ranges on its 242-mile traverse of the desert.

These modifications of the physical state and hydrography of the Colorado River not only altered the river and its floodplains to an enormous degree but also allowed areas of the desert to be farmed and built upon.

The need for a comprehensive plan for the California Desert was recognized in the early 1970s. Congress, in enacting the Federal Land Policy and Management Act (FLPMA), specifically provided for planning in the California Desert which would allow for multiple use of the public lands while maintaining environmental quality. The particular mention of the California Desert apart from other desert areas was in response to public demand for comprehensive federal management of desert resources and social recognition of conservation needs in this region. A great deal of public response was received by BLM to the draft Desert Plan. /143/

The desert marshes that now exist in the region of the Salton Sea and Colorado River are largely preserved as national wildlife refuges, state wildlife areas, and private duck clubs. These refuges include Salton Sea National Wildlife Refuge, Imperial State Wildlife Area, Havasu National Wildlife Refuge, Cibola National Wildlife Refuge, Imperial National Wildlife Refuge and about 50 duck clubs on the Salton Sea.

Use figures of refuges are an index to the value of these wetland areas to the public. Specific activities engaged in by users indicate the relative dependence of visitors on wetlands in contrast to other habitats within the refuge.

TABLE 15

VISITOR USE DESERT WILDLIFE REFUGES

Salton Sea National Wildlife Refuge

| | |
|---|---|
| 1975-1976 | |
| Fishermen | 5,895 |
| Hunters | 1,097 |

Imperial State Wildlife Area

| Waterfowl Hunters | Wister-Salton Sea Unit | Finney-Ramer Unit |
|---|---|---|
| 1980-1981 | 7,701 | 478 |
| 1979-1980 | 8,881 | 681 |
| 1978-1979 | 8,794 | 609 |
| 1977-1978 | 8,941 | 583 |
| Fishermen | | |
| 1980-1981 | 2,869 | 13,483 |
| 1979-1980 | 3.415 | 12,938 |
| 1978-1979 | 2,133 | 9,000 |
| 1977-1978 | 2,622 | 7,699 |
| Birdwatching and Nature Study | | |
| 1980-1981 | 587 | 1,957 |
| 1979-1980 | 601 | 1,680 |
| 1978-1979 | 387 | 1,379 |
| 1977-1978 | 763 | 1,149 |
| Other Recreation, Including Upland Hunting, Camping, and picnicking | | |
| 1980-1981 | 1,032 | 5,168 |
| 1979-1980 | 2,156 | 5,115 |
| 1978-1979 | 1,731 | 4,062 |

TABLE 15 (continued)

| Other Recreation, Including Upland Hunting, Camping, and Picnicking (Continued) | Wister-Salton Sea Unit | Finney-Ramer Unit |
|---|---|---|
| 1977-1978 | 2,459 | 6,026 |
| Total Visits | | |
| 1980-1981 | 12,189 | 21,086 |
| 1979-1980 | 15,053 | 20,414 |
| 1978-1979 | 13,045 | 15,050 |
| 1977-1978 | 14,785 | 15,457 |

Cibola National Wildlife Refuge

| 1981 | |
|---|---|
| Total Visits | 76,600 |
| Hunting | 9,000 |
| Fishing | 12,600 |
| Birdwatching, Nature Study | 34,000 |
| Recreation-waterskiing, boating | 19,000 |
| Environmental Education | 1,000 |

Havasu National Wildlife Refuge

| 1981 | |
|---|---|
| Total Visits | 1,056,690 |
| Waterfowl Hunting | 2,700 |
| Warm-water Fishing in Marsh | 92,700 |
| Other Recreation (boating, cold-water fishing, waterskiing) | 961,290 |

Source: Manager, Salton Sea NWR; Christopher Gonzales, Imperial Wildlife Area; Wesley Marin, Cibola NWR; Fy Berry, Havasu NWR

# OVERVIEW OF REGULATORY FRAMEWORK

INTRODUCTION

Just as the chronology of social, economic, technologic, and other factors which have influenced the disposition of California wetlands reveal trends over the past 180 years, so do legislative and judicial events, public policy, and rule-making, especially in the past decade. The institutional "governance" of wetlands is carried out by a large and complex network of agencies, frequently acting unilaterally, sometimes in conjunction with other agencies or individuals and the public. The proponent of a project or action requiring an entitlement in wetlands or related areas is confronted by a bewildering array of actors and requirements, masking the effects of programs which, taken individually, may be relatively straightforward.

The following discussion reviews the principal agencies which now play a direct or indirect role in wetland protection in California. The principal legal instruments are reviewed in the context of the agencies that have primary responsibility, authority, and/or funding for their exercise in California. The institutions and their processes are divided into three categories, or "levels". The *federal level* in California is dominated by EPA and the Corps and supported by numerous agencies that manage federal lands in California and their directives. Formal federal-state interactions link this level with the *state level*, which is inhabited by a number of "resource" agencies and departments with statewide and regional programs and powers that directly or indirectly govern use of wetlands. The *local level* is composed of municipalities and special districts which are highly variable in local attitudes, resource policies, and exercise of powers. *Private or public-private institutions*, programs, and individual initiatives also offer protection of wetlands to some degree.

These levels of laws, programs, and policies are differentially distributed across the California landscape, as are the wetlands which they concern; their institutional boundaries form a patchwork which is multi-tiered in some areas (San Francisco Bay, the Coastal Zone) and missing altogether in others (much of the Central Valley). The avenues

through which they influence wetlands are, in part, direct including a few statutes and directives which address specific wetland areas or wetlands in general. However many are indirect, or oblique, influencing wetlands through *water quality or quantity, vegetation management, fish and wildlife species and habitats, endangered species, water navigability, floodplain management, public trust, coastal resources,* and *environmental and land use controls.*

The ultimate effectiveness of both instruments and agencies in protecting wetlands can be viewed in several ways: 1) in terms of their inherent features, (e.g., the scope of geographic and lateral jurisdiction, activities covered, and authority); 2) in terms of their actual exercise or practice by agencies and individuals; and 3) in terms of the net effect on wetlands. It is the last of these criteria that is the emporical test of effectiveness. Unfortunately, this criterion is measureable only occasionally in actual acres of wetland that have been destroyed, filled, protected, and/or restored.

FEDERAL

The federal "presence" with respect to the disposition of wetlands and other water-related lands in California is evident in several forms. 1) Direct or delegated permit and licensing authority is exercised by the Corps of Engineers, Federal Energy Regulatory Commission, EPA, and others. 2) Under memoranda of agreement, a number of federal agencies submit comments on Corps' and other federal permit actions and projects and administer related laws and programs. These include Fish and Wildlife Service and National Marine Fisheries Service. 3) Funding of many state and local grant-in-aid programs and federal works projects require compliance with federal environmental regulations and policies and/or consistency with the state's approved coastal zone management program and water quality objectives. Finally, 4) forty percent of California lands are owned and managed by federal agencies, subject to federal laws and directives concerning management of sensitive resources such as wetlands, endangered species, and riparian zones. Some of California's water is also administered by the federal government. The more important of these agencies are discussed below with respect to their role in California wetlands.

LAWS AND DIRECTIVES WITH GENERAL APPLICABILITY

National Environmental Policy Act (1969)

NEPA and its implementing regulations (revised 1978) set forth the basic national charter for protection of the environment. No specific reference is made to wetlands, but the comprehensive statement of policy (Sec. 101[a]) and environmental impact assessment (EIS) procedure (Sec. 102) leave little doubt that "natural aspects of our national heritage are to receive a level of protection." Major actions proposed by federal agencies are subject to NEPA and generally require an EIS; actions in which federal agencies have permit or licensing authority, or provide federal funds are also subject to NEPA. At the least, an

environmental assessment is prepared, and significant impact (or not) is determined. An EIS may or may not be required, but findings must be made in a record of decision.

NEPA has had a secondary effect on other environmental statutes and regulations./145/ Its importance in wetlands protection rests largely in its broad declaration of national interest in those natural resources which are declared to be valuable in other, more specific, policy statements. NEPA is important in particular to Corps Sec. 404 and Sec. 10 permit applications, which are subject to environmental assessment under NEPA. On occasion, an EIS is also prepared.

NEPA in itself is not an adequate instrument to assure consistent federal protection to wetlands in California, even though it reinforces the criteria of "public interest review" used by the Corps in review of permit applications. NEPA's statutory scope as applied to lesser specific actions is limited in several ways: Major federal actions, and actions having a significant effect on the human environment are generally subject to an EIS. The former limitation excludes a large number of individually minor but cumulatively significant projects. The latter may result in greater weight in a project impact evaluation being placed on effects on the "human environment," in the absence of pressure from local constituencies for wildlife and fish. NEPA also does not require that detailed mitigation plans be assured by the EIS; /145/ typically, mitigation is a key consideration in evaluating proposed uses in or near wetlands.

In California, the NEPA process articulates well with the California Environmental Quality Act (CEQA). What one lacks, the other supplies. For example, CEQA is less specific than NEPA in alternatives analysis, but stronger in mitigation requirements. Environmental Impact Reports (EIRs) under CEQA, prepared by local agencies for projects subject to Section 10/404, are generally more than satisfactory bases for the Corps' environmental assessment under NEPA.

Executive Order 11990: Protection of Wetlands

Executive Order 11990, promulgated by President Carter in 1977, recognizes the significance of wetlands and requires federal agencies to minimize the destruction or loss of wetlands in managing their lands, providing federal funds, or carrying out their own public works projects. (Table 1)

The executive order established several major requirements for federal agencies to fulfill before authorizing new construction in wetlands: 1) determine whether there is a practicable alternative to the action. If so, the action shall not be undertaken in wetlands; 2) include practical measures to minimize harm to wetlands (where no alternative upland locations exist for a proposed project); 3) preserve and enhance the natural and beneficial values of the wetlands; 4) involve the public early in the assessment of any action proposed in wetlands.

E.O. 11990 is an important directive to all of the federal agencies that manage federal land in California, sponsor federal projects, or provide funding assistance for state and local projects. Since not all federal projects are subject to the provisions of the Section 404 program, few are subject to Section 10, and NEPA provides general environmental guidance only, E.O. 11990 serves as the one directive which is specific to projects involving wetlands. It is incorporated by reference in most federal land management plans and programs in California and is a routine component of their environmental planning. /160b/

The order plays a secondary role in formulation of Corps projects, which are more likely to be influenced by input under the Fish and Wildlife Coordination Act, Endangered Species Act, or Section 404 itself. However, other agencies must demonstrate consistency with E.O. 11990's intent.

The definition of wetlands under both E O. 11990 and 1975 Corps regulations refers to vegetation that *requires* saturated soil conditions, whereas the Corps 1977 regulations refer to vegetation that is typically *adapted* to saturated soil conditions. The latter definition is broader

in its potential inclusion of riparian vegetation that tolerates periodic inundation but may not require it for growth and reproduction. This distinction apparently has not received close attention in California.

Executive Order 11988: Floodplain Management

President Carter issued E.O. 11988 in 1977 to update an earlier, similar E.O. which President Johnson had issued in 1966. E.O. 11988 sets forth the requirement that federal agencies modify their programs and procedures to avoid encroachment in floodplains and mitigate flood losses if encroachment is unavoidable. Like E.O. 11990, the floodplain management order places an obligation on federal agencies to coordinate efforts and avoid unnecessary project impacts.

The Floodplain Management E.O., as well as the programs of the Federal Emergency Management Agency, are only indirectly beneficial to wetland protection. The thrust of floodplain management is to assess flood risk, minimize probability of floods by controlling encroachment into floodplains, and establish design standards to reduce hazard risk to human settlements (e.g., minimum first floor elevations), not to protect the natural values of the floodplain for their own sake. /54/ This contrasts with wetland protection, in which the thrust is first to avoid any encroachment and, second, to design so as to buffer the wetland from indirect damage from adjacent development. E.O. 11988 is effective in wetland protection in California only in combination with NEPA, E.O. 11990, federal and state agency comment under the Fish and Wildlife Coordination Act, and/or the cooperation of local governments participating in the National Flood Insurance Program. Corps flood control projects occasionally conflict indirectly with E.O. 11988, since their intent is to reduce the floodplain itself, generally after encroachment has already occurred.

A-95 Review Process

Through the A-95 review process, established by the Office of Management and Budget in 1968, applications for federal grants-in-aid to state, regional, and local government are circulated through a

clearinghouse composed of state and areawide agencies. The purpose of the process is to identify possible conflicts between the federal government and the actions of state, regional, and local governments and to encourage coordination among various levels of government. /54/

This process has assured that environmental documents concerning federally assisted projects in floodplains and wetlands are reviewed for compliance with regional and local plans. In California, the A-95 clearinghouse-designates have generally been regional councils of government, such as Association of Bay Area Governments (ABAG), San Francisco, Southern California Association of Governments (SCAG), and so on. Corps Public Notices also circulate through this clearinghouse for comment. With respect to protection of wetlands in California, the A-95 process is only as effective as the federal and state directives and policy which it serves and the regional political biases which it also reveals. The process generally has not been applied to resolving areas of conflict in Corps permit review.

Coastal Zone Management Act (1972)

The Coastal Zone Management Act, adopted overwhelmingly by Congress in 1972, addresses a range of coastal planning issues, wetland protection among them. Instead of directly regulating coastal regions of the United States, the Act provides for funding assistance to states which meet the criteria of the CZM Program by defining a Coastal Zone, identifying critical planning areas within it, designating appropriate uses, and establishing an effective means of implementing state and local programs to "influence" coastal land use. /54/ Concern for wetlands was specifically addressed in the 1980 reauthorization of the CZMA.

The program is admistered by National Oceanic and Atmospheric Admistration (NOAA) and its Office of Coastal Zone Management (OCZM). Under Section 305, OCZM administered grants to states, including California, for development of their own programs. Under Section 306 of the act, numerous grants were awarded for implementing parts of the

California Coastal Plan, until funding of the Office of Coastal Zone Management was sharply curtailed in 1981. The Section 305 role was of particular significance in funding California's development of a Coastal Plan, and Section 306 has enabled much of the implementation of Local Coastal Plans through which wetlands and other critical resource areas will continue to receive a level of protection heretofore never envisioned by coastal communities.

The influence of the CZM on wetlands protection is felt in California in two ways. Federally funded projects and projects on federal lands must be consistent "to the maximum extent practicable" with approved state plans, expressed in the state's Coastal Zone Management Program (Coastal Plan). This provision seeks to balance federal activities in the Coastal Zone with the need for consistency with the state's programs. Numerous federal land holdings in both San Francisco Bay and along the coast, primarily military, are subject to this requirement, buttressed by E.O. 11990 and E.O. 11988.

The second influence is felt through the 404 regulatory program. Briefly, Section 404 of the Clean Water Act (CWA) calls for certifying that 404 permit actions are consistent with the state's Coastal Zone Management Program. Again, the wetlands of both San Francisco Bay and the coastal zone are thus "protected" by this mechanism. Discussion below points out the significant differences between the bay and coastal programs in wetlands that are and are not covered by this certification process.

## MANAGEMENT OF FEDERAL LANDS AND WATER IN CALIFORNIA

Forty percent of California's land is in federal ownership. In addition, a substantial portion of California water is managed by the federal government, subject to the state's basic authority to allocate quantities of water (CWA Section 101[g]). The majority of these lands are managed by the Bureau of Land Management and the Forest Service.

The Department of Defense (the Air Force, Navy, Army including Corps of Engineers, Marine Corps) also manage extensive lands, many containing small but significant wetlands. The National Park Service manages park lands, and the U.S. Fish and Wildlife Service maintains National Wildlife Refuges on the coast, in the Klamath Basin, Central Valley, San Francisco and San Pablo Bay, along the Colorado River, etc. The Bureau of Reclamation manages the Central Valley Project and other water supply, distribution, irrigation, and agricultural return systems. The Bureau's reclamation programs in the past have had a profound impact on waterfowl habitat in California.

Thus, the opportunity for federal control of significant actions involving wetlands and riparian areas in the state is substantial. Even though federal lands are theoretically "protected" from ordinary private development, they are used in a variety of ways—leased for grazing, subjected to industrial activities, urbanized for living quarters, logged, etc. Many of the major fills in wetlands in California in the 1930s, 1940s, and 1950s were for military installations.

Federal management of lands is subject to E.O. 11990 and E.O. 11988 as well as NEPA and, through various coordinating mechanisms, to state policy, the specific policies of the Wetland Protection E.O., the regulations of NEPA, and the general guidelines of the Federal Land Planning and Management Act (FLPMA) are the principal bases for managing and protecting wetland resources. Along the coast, the Coastal Zone Management Act provides an additional policy base.

Both Forest Service and BLM have developed their own guidelines for land management under FLPMA. These call for identification and protection of wetlands and other critical resource areas within the overall requirements of multiple use management. All federal agencies are required to develop implementing procedures under NEPA. The Endangered Species Act requirement for biological assessment and consultation (Section 7) lends further assurrance that the sensitive resources of federal lands will receive appropriate attention along with other resource uses.

SECTION 10/404 REGULATORY PROGRAM

U.S. Army Corps of Engineers

The Corps of Engineers is the single potentially most influential public agency in California wetlands, with its permit powers and project responsibilities for port maintenance dredging, deep water channel construction, levee construction, flood control, dam construction, shore stabilization, among others. The following overview does not provide a detailed analysis of the Corps Section 10 and 404 program responsibilities and authorities in California. Rather, it outlines key elements of the program, emphasizing those components which are most relevant to the California region and to one or more of the three Corps district, or which are most indicative of the program's effect in California. That effect can be considered variously beneficial to the protection of wetlands, detrimental to project sponsors, or simply ineffectual by its absence. (See also Evaluation of Effectiveness)

The general elements of the program are familiar:

- Section 9 - 10, Rivers and Harbors Act of 1899—regulates the diking, filling, and placement of structures ("works") in navigable waterways.
- Section 404, Clean Water Act—regulates disposal of dredge and fill materials in the "waters of the United States." This phrase has been judicially and administratively interpreted to include all streams to their headwaters (5 cubic feet per second, average annual water flow; and contiguous wetlands, including those above the ordinary high water mark in nontidal waters and mean high tide in tidal waters).

Section 10. The 1899 law originally had the intent of protecting waterway navigability by regulating construction of any structures in and/or over the water, excavation or deposition of materials, or other activities affecting the course, location, condition, or capacity of such navigable waterways. In 1968, the Corps revised its policy with

respect to review of permit applications, establishing "public interest review" to respond to growing national concern over environmental values and to incorporate the intent of related federal legislation such as the Fish and Wildlife Coordination Act. NEPA passage in 1969 reinforced this environmental perspective. Even prior to NEPA, the public interest review had registered its effect in the San Francisco District of the Corps in the form of public hearings on controversial projects requiring Section 10 permits.

The public interest concept has expanded since that time, encompassing now a wide spectrum of local and regional criteria such as land use, economics, and flood control, in addition to fish and wildlife, ecology, pollution, and traditional navigability. Criteria involving availability of alternatives, permanence of impacts, and cumulative effects were adopted in 1974. The Corps also adopted a wetlands policy which requires that particular weight be given to that factor unless benefits (of a proposed project) can be demonstrated to outweigh damage to the wetlands resource, the alteration be proved necessary to realize those benefits, and the proposed activity be primarily dependent on proximity to water. These criteria are now implicit in Section 404 review (33 CFR 320.4[b]).

The scope of Section 10 jurisdiction is significant in California, since Section 10 is frequently exercised separately from Section 404 in all three Corps districts. "Navigability" under the Rivers and Harbors Act gradually broadened in definition, and was codified in 1972 (33 CRF 329) to extend to the ordinary high water mark in nontidal waters and mean high water (MHW) in tidal waters. These lines incorporated varying amounts of contiguous wetlands by virtue of elevation alone. The MHHW line on the Pacific coast was successfully challenged by Leslie Salt Co. in San Francisco Bay in 1978. That case (Leslie Salt v. Froehlke) rendered MHW lateral scope of Section 10 and Section 404 jurisdiction consistent in all coastal waters. It also affirmed that 404 jurisdiction extends beyond traditionally navigable waters. /53/

Activities that might affect navigable capacity under Section 10 jurisdiction have received considerable judicial interpretation. Section 10 continues to be a useful regulatory tool in all three districts; however, it is applied in different kinds of situations and reflects different administrative postures on the part of the three districts. Los Angeles and Sacramento districts apply Section 10 primarily to protect navigable capacity and do not extend their jurisdiction into diked formerly navigable areas. San Francisco has applied Section 10 to certain areas behind dikes, based upon traditional navigability indirectly protecting wetlands.

Section 404. Section 404 of the Clean Water Act regulates the deposition of dredged and fill material in all waters of the United States. Like Section 10, this authority extends shoreward to the plane of mean high water in tidal waters and the ordinary high water mark in nontidal waters. However, it goes considerably beyond this definition in applying to all "waters of the United States." (Table 1)

The development of Section 404 overlaps somewhat with the evolution of Section 10. Whereas Section 10 called for protecting navigable capacity, the Federal Water Pollution Control Act Amendments (FWPCAA) (1972) called for restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. In the Act's statement of purpose and later sections, the concepts of "water quality" and "pollution" were established, and "fill" (in various forms) and "dredged material" were defined as pollutants. Various sections of FWPCAA (now Clean Water Act) address discharge of point and nonpoint source pollutants, such as Section 208, 301, 402, and 404, but wetlands are not specifically referenced.

Section 404 legislative and judicial history is long and complex. Several key points emerge: the definition of lateral scope was at first limited to navigable waters but was later expanded to include all waters of the United States, including adjacent or contiguous wetlands. This expanded definition was published in interim final regulations as early as 1975. The placement of fill material was broadly construed

(and defined) to include a variety of activities (excavation and removal of vegetation notably excluded); and the geographic scope of jurisdiction was expanded up into the headwaters of navigable waters by 1977.

The three points above — lateral jurisdiction into wetlands, definition and scope of polluting activities constituting "fill," and geographic scope into all waters of the United States—have caused the most consistent problems and controversy in exercise of the Section 10/404 permit program in each of the three California (Pacific Southwest Division) districts. Broad interpretation of these three points is also responsible for most of the benefits that have accrued from the three district regulatory programs.

Under present regulations, all saline, brackish, or freshwater wetlands (characterized by prevalence of vegetation that is adapted to saturated soil conditions) which are adjacent to navigable waters are subject to Corps jurisdiction under this Section. Such lands may occur in both tidal and diked situations in California. The exercise of 404 authority over lands behind dikes varies, however, from one Corps district to another. The San Francisco District exercises Section 10 and/or Section 404 authority in the majority of San Francisco Bay diked lands, while the Sacramento District exercises only Section 404 in a few diked marshes in the Delta. The long history of reclamation and subsidence has brought a major part of the Delta well below MHW; even though large agricultural tracts are periodically flooded, in the Corps' view, these reclaimed lands were not "historic navigable waters" prior to reclamation. /21/ (This is generally confirmed by State Lands Commission which designates the majority of these lands as "swamp and overflowed.") The Los Angeles District has very few cases involving diked wetlands and has generally not asserted jurisdiction over these areas.

The Corps' practice is to issue public notices on proposed projects and invite comments from all interested parties. The Corps can deny permits to those applicants whose projects are determined not to be in the public interest. Generally, Corps permits will not be issued in

those instances where required state or local authorizations have been denied. As with interpretations of scope, each Corps district has established its own practices in dealing with permit applications and public notices, with varying success. Individual district procedures are elaborated in the Evaluation of Effectiveness Section.

Certain exemptions from Section 404 are noteworthy, in the context of California wetlands. Neither excavation nor removal of regetation, including riparian, is covered by the 404 program. Specific exemption is granted to certain maintenance activities, normal agricultural practices, temporary roads, stock ponds, irrigation ditches, etc., which require discharge of fill. The effects of these exemptions are not well-documented in California. Federal projects which have received Congressional authorization and for which the effects of discharge of fill or dredged material have been discussed in an EIS or equivalent are also exempt. This exemption could remove a substantial number of major federal projects in California from the 404 process. The supporting directives — E.O. 11990, Endangered Species Act, and others, assume particular importance in such cases.

Finally, the nationwide permit system for fill discharge above the headwaters — streams under 5 cfs average annual flow, and isolated wetlands — exempts a wide variety of activities from individual permits and thus from effective surveillance. Property owners and developers without doubt welcome this freedom from the strictures of individual regulation. The seasonal nature of California's stream flows, however, is such that many riparian corridors and small freshwater wetlands are effectively removed from protection.

Environmental Protection Agency (EPA)

EPA's role in California's 404 program is one of program oversight. The role is more closely defined in a memorandum of agreement between EPA and the Department of the Army and in EPA's 404 regulatory guidelines. The principal areas of EPA's responsibility are in promulgating 404(b) guidelines and criteria for review of permits, review of Congressionally authorized or other federal projects which claim exemption from 404, specific review of proposed discharge sites, and review of delegation of 404 authority to states, in the event that a state chooses to assume delegation. Thus, EPA, in effect, can veto Corps permit actions and define states' 404 programs.

EPA has delegated to the states authority to administer the National Pollution Discharge Elimination System (NPDES) permits under Section 402 (CWA) and to certify that permitted actions are consistent with states' water quality objectives under Section 401. The NPDES (402) program parallels 404, regulating the point source discharge of wastewater rather than solid material and emphasizing reduction of pollutant discharge (through available technology) rather than alternatives to discharge. Solid waste disposal falls somewhere between these two definitions of pollutant. /5/ As a result, the Corps' has failed on occasion to assert 404 authority over expansion of sanitary landfills into wetlands, placing the burden of decision on EPA.

COMMENTING AGENCIES

U.S. Fish and Wildlife Service (USFWS)

The Fish and Wildlife Service operates under a number of statutory and administrative authorities but does not have direct permit authority in wetlands. Among these are the Fish and Wildlife Coordination Act, Estuary Protection Act, Migratory Bird Act, Land and Water Conservation Fund Act, Marine Mammal Protection Act, and Endangered Species Act. Under these authorities, the agency's basic responsibilities concern

migratory birds, fish, waterfowl, and endangered species. The Service shares interest in anadromous fish with National Marine Fisheries Service, whose primary responsibilities lie in marine and estuarine resources.

In conjunction with the Corps' Section 10 and Section 404 Permit Program, the Service reviews and provides technical assistance to applicants for federal permits and other developments in or affecting navigable waters. A Memorandum of Agreement between the Departments of the Army and Interior is basic to the coordination process, which was further established in the Code of Federal Regulations in 1975, and modified in "Review of Fish and Wildlife Aspects of Proposals in or Affecting Navigable Waters" (40 CFR 55810-55824, May, 1980). This Army-Interior MOA provides that when the USFWS has unresolved objections to a project at the time the Corps' District Engineer makes a determination to grant a permit, the USFWS can insist that the issue be referred to higher authority within the Interior and Army Departments, up to the secretarial level in Washington if necessary.

Under the Fish and Wildlife Coordination Act (1958) the USFWS reviews federally permitted, funded, or constructed projects with the goal of protecting and where possible restoring the fish, wildlife, and natural values of waters and related wetlands. The Coordination Act, which plays an important role in the Corps' denial or conditioning of permits, mandates that any department or agency of the United States, or any public or private agency under federal permit, license, or funding, proposing to modify any stream or other body of water, shall first consult with the Fish and Wildlife Service to determine the effects of the proposed projects on fish and wildlife resources. It was the Coordination Act responsibilities that prompted the Corps to incorporate "public interest" factors into its Section 10 permit evaluation criteria in 1968. The USFWS Region 1 Ecological Services

field offices in California continue to play an important role in influencing Corps permit decisions and conditions. The criterion of "water dependency" (of projects in wetlands) is consistently upheld by California FWS personnel.

The Endangered Species Act, recently reauthorized in 1982, requires all federal agencies to consult with Fish and Wildlife Service when any federally funded, authorized, or approved projects or actions might affect the habitat of an endangered or threatened species. The USFWS is directed to identify and list these species and develop plans for their protection and recovery, principally through management of critical habitat. The Act sets forth a formal consultation process (Section 7) that requires first a biological assessment, where the presence of an endangered species is suspected, and mitigation plan in the event of project approval.

The mere fact that most types and areas of California wetlands have been so reduced over the past 130 years defines many of them as critical habitat for several narrowly adapted species whose existence depends on the maintenance of wetland habitat. In marginal cases of isolated wetlands, the Corps has been prompted to take individual permit jurisdiction largely because of the coincident presence of one or more federally listed endangered species.

The Land and Water Conservation Fund Act (1977) provided USFWS with funds and authority for a number of years to acquire critical habitats and sensitive resource lands in California, many of them wetlands. Funds were also made available to states for acquisition and grant-in-aid development programs, under the general goal of developing outdoor recreation opportunities. Funds for the future protection of wetlands in California are unlikely to emanate from this source; no monies were budgeted for 1982.

Among its research activities, USFWS developed the Classification of Wetlands and Deepwater Habitats of the United States. To aid

in implementing provisions of the Clean Water Act (1977), USFWS is conducting a National Wetlands Inventory, mapping the wetlands of the United States, using the classification system. The Corps regulatory definition of wetlands is a subset of the USFWS system. Many areas in California that are mapped by the NWI as wetlands are not necessarily protected by the 404 program.

Another important USFWS function is acquisition and management of National Wildlife Refuge areas, such as in the San Francisco Bay, Central Valley, Klamath-Modoc region, and along the Colorado River. USFWS is also a land acquisition agency through the National Migratory Bird Conservation Program. The Service has funded several major waterfowl and other wildlife habitat planning studies in the Central Valley, identifying future acquisition priorities. /137,138/

National Marine Fisheries Service (NMFS)

A part of the National Oceanic and Atmospheric Administration in the U.S. Department of Commerce, the National Marine Fisheries Service like USFWS, has no direct permitting authority. Under the Fish and Wildlife Coordination Act, NMFS reviews federally initiated, licensed, or permitted projects which have the potential of altering aquatic environments and biological resources. Existing or potentially restorable spawning, rearing, food-producing, or other habitats necessary for the survival of marine estuarine, or anadromous resources are of particular concern.

The water-dependence of the proposed activities is a positive consideration in determining project approval. Conditions are recommended which would eliminate or minimize adverse environmental impacts, compensate for unavoidable adverse environmental impacts, and assure that post-project habitat value is equal to or greater than pre-project value.

The NMFS specifically comments on Corps public notices for particular projects. In California, occasional conflicts arise between

the objectives of NMFS and USFWS with respect to restoration of diked or degraded wetlands. Whereas USFWS emphasizes restoring habitat value for waterfowl and other water-associated birds, not necessarily achieved by restoring tidal inflow, NMFS favors restoring fish habitat predicated on restoring tidal interchange. The two agencies try to seek agreement, realizing that their overall goals are generally compatible.

STATE OF CALIFORNIA

The State of California manages or exercises control over the natural resources of the state under the legislative and administrative authority of a wide variety of general and specific laws and directives, carried out through the agency of "resource" departments, commissions, and boards. The primary agencies affecting wetlands and water-related lands are the Resources Agency and several of its "member" agencies: Department of Fish and Game, State Lands Commission and Division, Reclamation Board, Department of Water Resources, San Francisco Bay Conservation and Development Commission, the Coastal Commission, State Coastal Conservancy, State Water Resources Control Board and Regional Water Quality Control Boards, Department of Parks and Recreation, Department of Boating and Waterways, Department of Conservation, and Department of Forestry. The Office of Planning and Research implements state planning law and coordinates the state environmental review process.

The authority of state agencies with respect to wetlands is expressed similarly to that of the federal government. That is, agencies have: 1) direct or delegated permit authority; 2) opportunity to comment on federal and, at the other end of the spectrum, local actions where state law, policy, memoranda of agreement, or funding are involved; 3) opportunity to comment on the development actions of other agencies of the state; and 4) management or administration of state-owned lands or lands carrying the public trust easement.

A recent analysis of the state's role and powers in regulation and/or protection of wetlands reviewed 59 statutes to evalute their relationship and relative effectiveness in protecting wetlands and other water-related lands. /48/ A second analysis reviewed those laws and agencies which specifically govern San Francisco Bay diked historic baylands. /102/ Both analyses provide information which is useful in the following section on the state's role. A brief chronology of significant laws, judiciary decisions, and policies which direct the state's position is presented in Table 16.

TABLE 16

DATES AND MILESTONES AFFECTING CALIFORNIA WETLANDS

1850 Arkansas Swamp and Overflowed Lands Act (9 U.S. Stat. 519) granted to several states (including California) all swamp and overflowed land, defined as lying above the ordinary high watermark and subject to only partial inundation; lands so defined are not subject to Public Trust.

1850 Admission of State of California to the Union. Granted to the people of California, title to all tidal and submerged lands for public purposes of commerce, navigation, and fisheries.

1850 ca. 1870 - sale of extensive areas of both swamp and overflowed lands for reclamation and tidal lands, the latter subject to the Public Trust. (The difficulty of distinguishing between swamp lands and tidal lands has led to a history of conflict in resolution of title in many areas of wetland.)

1965, amended 1968 McAteer-Petris Act establishes the San Francisco Bay Conservation and Development Commission and authorizes the Commission to develop a Bay Plan. Regulates Bay fill and uses in a designated 100-foot shoreline band, including salt ponds and some managed wetlands. Principal policies concern protection of fish and wildlife resources, public access to the Bay shoreline and controlled development of water-related activities.

1970 California Environmental Quality Act establishes broad environmental protection authority for public agencies, requiring examination of all public and private projects determined to have potential significant impact on the environment.

1971 Marks v. Whitney. Defines public trust easement to encompass "preservation of (tidelands) in their natural state..." in addition to traditional uses of commerce, navigation, and fisheries.

TABLE 16 (continued)

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|---|---|
| 1972-1976 | Proposition 20, and the California Coastal Act. California Coastal Commission has planning and permit authority for regulation of development within the Coastal Zone. The Act contains statutory definition of and references to "wetlands" and appropriate and non-appropriate uses of wetlands and other sensitive aquatic and water-related habitats. Local jurisdictions are authorized to prepare and implement Local Coastal Programs. |
| 1976 | Keene-Nejedly California Wetlands Preservation Act. Directs and funds Department of Fish and Game and Department of Parks and Recreation to conduct study to identify wetlands for protection or acquisition (19 wetlands so identified). |
| 1976 | Stream Alteration Agreements. Provides authority to Department of Fish and Game to negotiate conditions with applicant who proposes project that would disrupt streambeds and overflow areas. |
| 1977 | Resources Agency Wetland Policy. Establishes basic policy to be observed by all state departments...for protection, use, conditions, mitigation, and compensation with respect to wetlands. (Wetlands are not defined in the policy.) |
| 1977 | Suisun Marsh Preservation Act. Establishes primary and secondary management zones over one of the largest remaining California wetlands and empowers local agencies to adopt and implement Local Protection Plans. |
| 1979 | Senate Concurrent Resolution 28, (Keene). Calls for identification of sites and plan to increase amount of wetlands in California by 50% by 2000. Emphasis is on Central Valley waterfowl wetland habitat. |
| 1978-1979 | Amendments to Porter-Cologne Water Quality Control Act. Establishes the State and Regicnal Boards and state permit program covering all waste discharges which may affect water quality (other than discharges to navigable waters), including discharges |

TABLE 16 (continued)

onto land or underground (if water quality might be affected); provides basic authority to receive 404 delegation, and sets requirements for self-monitoring of point source waste discharge.

1981 Statewide Interpretive Guideline for Wetlands and Other Environmentally Sensitive Habitat Areas. Adopted by Coastal Commission to be used as tool in delineation of wetlands, control of land use in sensitive habitats, and planning for restoration of wetlands.

LAWS AND DIRECTIVES WITH GENERAL APPLICABILITY

Environmental Review Process

The California Environmental Quality Act (1970) is patterned after NEPA, setting forth the state's basic charter for protection of the environment. The Act requires that projects which may have a significant effect on the environment and which involve discretionary governmental action be subject to an environmental review process. The Environmental Impact Report (EIR) is the major device used by state and local agencies to investigate the environmental impacts of proposed projects where significant impacts and public controversy are recognized.

Among other policies, CEQA policies call for preventing the elimination of fish and wildlife populations and preserving examples of all plant and animal communities. The CEQA guidelines (15161.6) require that the environmental documents for proposed projects of areawide, regional, or statewide significance be submitted to area councils of government and the State Clearinghouse for review and comment. Specific wetland areas are listed (e.g., Suisun Marsh, Sacramento-San Joaquin Delta, wild and scenic rivers, etc.), and the resources in general (wetlands, riparian lands, marshes, etc.) are defined as meeting this criterion of significance. Neither the Act nor its administrative guidelines refers specifically to placement of fill or dredge spoils as having "significant effects." Some potential byproducts of such actions are listed, however (e.g., adverse effects on rare or endangered plants, fish, or wildlife species; degradation of water quality; substational siltation, etc.).

The Act's greatest general effect has been to sensitize the public and decision makers to the need for incorporating environmental considerations into planning and management of land and water resources. Undoutedly, this has helped also to shape public attitudes towards wetlands.

CEQA's usefulness in protecting wetlands is in part dependent on local values and the priorities of local constituencies. Where there is strong local interest in natural resources, CEQA can be effective. It is also dependent on reinforcement by specific state policies (below) and particularly on the "federal presence" in wetlands. Wetlands that are not covered by 404 jurisdiction will receive variable protection under CEQA.

Most projects in wetlands will require a local use permit in addition to possible state or federal permits or approvals. Unless the project is categorically exempt (minor projects presumed to be insignificant — replacement of structures, etc.), ministerially exempt (e.g., building permits), or carries other exemption (emergency action; action covered by another environmental review process, such as approval of Local Coastal Programs, or setting waste discharge requirements at existing facilities), it will be subject to an initial study, most likely followed by an EIR, prepared by the lead agency. This documentation provides a basis for the Corps' subsequent environmental assessment, where Section 10 or 404 apply.

The EIR thus serves the dual purpose of providing a basis for local review as well as for local input to the Corps' review. Successful articulation of these two processes requires early recognition and coordination of multiple agency requirements. Too often, the CEQA process has failed to anticipate the eventual requirements of the Corps and commenting agencies at the end of the "review line," misleading both applicant and local agency as to project feasibility and environmental problems. "Discovering" obstacles well into the review process is an indication of failure of both CEQA and the Section 404 program.

Keene-Nejedly California Wetlands Preservation Act, 1976, is the only state legislation other than the Coastal Act that defines wetlands in any degree (Table 16). The act states that there "is a need for an affirmative and sustained public policy and program directed at their (wetlands') preservation, restoration, and enhancement, in order that such wetlands shall continue in perpetuity." /21/

That act went beyond policy statement to provide for acquisition of ten important wetlands, using funds from several sources. Funds for preparation of a statewide wetlands plan, detailed in Section 5814, were item-votoed from the act. Such a plan has never been produced by Department of Fish and Game and Department of Parks and Recreation, the designated agencies.

Wetlands Resolution - Senate Concurrent Resolution (SCR) 28, 1979, was enacted, in part, in response to the governor's decision in 1976 to remove partial funding from the Keene-Nejedly Wetlands Preservation Act. The resolution called for a plan to be developed by January 1, 1983, which would identify wetland habitat sites such that the remaining acreage of wetlands in California could be increased by 50% by the year 2000. The goal of SCR 28 was politically justified by including a policy to increase public access to the state's coast and waterways.

The resolution does not contain any provisons or authority to protect existing wetlands. The focus of the plan, which is in preparation by Department of Fish and Game in accordance with the deadline, is on waterfowl habitat; the plan seeks to find innovative means, funding sources, and water sources, and to encourage private Central Valley wetlands to remain in that use, or to restore publicly owned wetlands or create new wetlands.

## STATE AGENCIES

### State Resources Agency

Under the present organization of California agencies and departments with primary responsibility for the natural resources of the state, the Resources Agency functions as an "umbrella." The agency sets major resource policy for the state, overseeing more specific policies and programs of member departments (Fish and Game, Water Resources, etc.), and coordinating interactions with the legislature on the one hand and with specific permit actions on the other, where resources of regional and statewide significance are involved.

The Resources Agency coordinates state agency comments on Corps permit applications as well as on environmental impact reports that go through the State Clearinghouse. In each evaluation, the Resources Agency considers the conformance of the application to existing state policy, programs, and plans. This mode of governmental coordination on natural resource issues is not assured into the future. Opponents have proposed dismantling the umbrella agency on the grounds that it represents an unnecessary layer of bureaucracy.

The Agency has set policy concerning wetlands in at least two important ways. First, the Agency coordinated the development of a Delta Master Recreation Plan (DMRP) and Waterways Use Program in 1976, which identified waterway zones in the Delta as "natural," "scenic," and "multiple use." The few remaining natural tidal and nontidal marshes and riparian areas in the Delta were thus identified as "natural" and their ecological sensitivity and significance acknowledged in a set of management guidelines. While the DMRP has no legislative authority, never having been codified, it has served as a guide, particularly to the Corps Section 10 permit program and to the Corps own construction programs in the Delta. The DMRP has never been popular with local Delta municipalities and landowners, both of whom regard any state policy-setting as infringement on local authority and property rights. /21/

The Resources Agency has had a second important impact on wetlands in California by establishing in 1977 a Policy for Preservation of Wetlands in Perpetuity. This policy served to coalesce a number of disparate state interests in wetlands into one relatively simple expression of statewide policy for protecting a disappearing resource. The policy guides departments, boards, and commissions of the Agency and requires that they "will not authorize or approve projects that fill or otherwise harm or destroy coastal, estuarine, or inland wetlands." Exceptions to the policy may be granted only if: 1) the proposed project is "water dependent or an essential transportation, water conveyance, or utility project"; 2) there is no feasible, less environmentally damaging alter-

native location; 3) the public trust is not adversely affected; and 4) adequate compensation is considered to be part of the project.

The policy was amended on July 30, 1980, to exempt wetlands of one-half acre or less provided that: 1) the wetland has insignificant biological, education, and recreational values; 2) it is surrounded by developments incompatible with a significant fish or wildlife habitat; 3) it is not adjacent to another wetland, waterway or open space; 4) it cannot feasibly be managed or restored to a significant level or biological productivity; and 5) its destruction would not adversely affect any unique, endangered, or rare plant or animal. The exemption is intended to apply only where the public benefits of the project far outweigh the loss of the wetland, e.g. in development of street or storm drain runoff in residential, commercial, or industrial areas. In addition, the exemption is accompanied by a condition requiring acre-for-acre compensation in the form of a new or restored wetland of significant biological value. This last requirement sets a minimum standard only.

The policy does not define "wetlands," but it does refer specifically to San Francisco Bay wetlands (without distinguishing between tidal and nontidal), to the Sacramento-San Joaquin Delta, and to other natural water bodies such as Clear Lake and the Colorado River. Most important, the policy recognizes that many areas of wetlands in the state are subject to neither federal nor state permit.

In spite of lacking either legislative authority or judicial test, the wetlands policy continues to lend considerable weight to the comments of Resources Agency member departments in state and federally authorized actions. It is less effective in locally permitted actions. Although subject under CEQA to environmental review and scrutiny by state agencies that support wetland policy, local projects may demonstrate overriding economic considerations and be approved in spite of potentially adverse effects on wetlands.

The wetlands policy is particularly vulnerable to political turnover in the state administration. The policy has been under attack as excessive, in part because it lacks clear definition of the resource itself (*viz.* wetlands), and thus may appear arbitrary when applied by Department of Fish and Game to marginally "wet" situations. More rigorous definitions must be called upon to avoid *ad hoc* field delineations. The policy is also attacked because "adequate compensation" is not defined. In the absence of standards, each case is left open to a negotiation under typically adversary, quasi-litigous circumstances. Notwithstanding the inherent defects of the policy, at the present time it is the only state instrument which potentially affords wetland protection outside the Coastal Zone, BCDC tidal marshes, Suisun Marsh, and publicly owned wetlands.

The Resources Agency also reviews any applications for entitlements which involve determinations of the state's interest and ownership of tidal lands. In the Delta, this continues to be a significant controversial and unresolved issue concerning the future disposition of both tidal and nontidal wetlands (below).

State Lands Division and Commission: Public Trust Doctrine

California became the owner of the majority of the tidelands within its borders when it was admitted to the Union on September 9, 1850. Most of California's tidelands still are owned by the state or the legislature's public grantees in trust. The State Lands Commission was designated by the legislature to have exclusive jurisdiction over the state-owned tidelands and submerged lands. About 70 cities, counties, and other entities such as port and harbor districts administer tidelands granted by the state. /40/

Also in 1850, under "An Act to Enable the State of Arkansas and Other States to Reclaim Swamplands within their Limits," (43 C.S.C. P. 981 et seq.), the United States granted "swamp and overflowed lands" to California for the purpose of reclamation. The land was surveyed by federal and state surveyors and sold or "patented" to

private citizens for the purpose of agricultural reclamation. The reclamation process resulted in the extensive peat-based agricultural land in the Sacramento-San Joaquin Delta. During the ensuing years, these lands have subsided through processes of compaction, oxidation, and wind loss until they are now up to 20 feet below sea level.

The federal act granting statehood to California specified that navigable waters within the state were common highways, subject to the public trust. However, the boundary jurisdiction of navigable waters was unclear. Illegal surveying performed by federal and state officials compounded the confusion. Much of the "swampland" which was sold off during the ensuing thirty years included navigable tidelands and submerged lands. Under the revised California Consitution of 1879, tidelands and submerged lands were to be held in the public trust for "commerce, navigation and fisheries." This trust since 1931 has also applied to all lands conveyed to private owners by the state.

California's courts have applied and expanded the common-law public trust doctrine. The California Supreme Court, in Marks v. Whitney in 1971, broadly defined the scope of the public trust easement to also encompass general recreation purposes and the preservation of tidelands in their natural state as ecological units, as open space habitat, and for scenery and climate of the area. /40/

In two cases, the California Supreme Court in 1981 held that the area between the seasonal high and low water mark of all nontidal navigable waters was subject to the public trust. Previously, the state's interest extended only to the ordinary high water mark for tidelands and the low water mark for navigable nontidal waters. The implications of these decisions are significant for wetlands in California; over 4,000 miles of California shoreland along 34 lakes, including Clear Lake and Lake Tahoe, streams, and their contiguous wetlands, are affected. One of the facts which the court noted was that the pressures of development could destroy nearly all of the

riparian vegetation along the Sacramento River within the next 20 years. /3/ The supreme court emphasized California's existing policies for protecting the ecological values of the shore zone and wetlands.

Preservation of the public trust in clearly defined tidelands and known historic wetlands (even though obscured by subsequent treatment of land) has allowed the state considerable authority in regulating the appropriate use of these lands. The public trust doctrine is useful in protecting wetlands. However, two points should be noted. First, the State Lands Commission is committed to managing easements for multiple use, pursuant to its common law public trust Constitutional charter. That is, SLC does not necessarily give fish and wildlife habitat first priority in negotiating mitigation/compensation requirements. Occasionally, this creates confusion in the applicants' program to provide compensation, since the Department of Fish and Game's compensation requests apply to habitat losses alone.

Second, the state's ownership of tidal lands and lands behind levees continues to be uncertain. Title searches and appraisals are time-consuming and are conducted only on a case-by-case basis. The uncertainty is particularly evident in the Delta, where many mixed tidal/swampland parcels were surveyed and sold and, subsequently, their landforms altered. Subsidence has further obscured the distinction between swamplands and tidelands. Thus, the state's claims in remaining Delta wetlands and in some San Francisco Bay and coastal wetlands is poorly known. /43/ The Commission has made considerable progress in compiling and researching historic maps of tidal and submerged lands.

California Department of Fish and Game

The department has a number of responsibilities and authorities which directly and indirectly influence projects and activities in wetlands and riparian areas. The broad charge of the department, expressed in the California Fish and Wildlife Plan (1966, in revision), states the department's overall objective: to maintain all species of fish and wildlife for their intrinsic and ecological values, and for their direct benefits to man, such as diversified recreational use, economic contributions, and scientific and educational use.

The Department of Fish and Game has authorities under specific sections of the Public Resources Code, Fish and Game Code, federal Fish and Wildlife Coordination Act, and administrative regulations and procedures to directly regulate or comment on activities in wetlands and riparian areas. The department is empowered to negotiate agreements in streambed alterations; it has some limited responsibilities with respect to native plant protection, and enforcement of state law concerning taking of endangered and rare animal species; it comments on all projects under consideration by other state and federal agencies which may affect fish and wildlife resources; it enforces state fish and game laws, including those that regulate waterfowl hunting; it administers and/or manages state-owned wildlife management areas, ecological reserves, and two national estuarine sanctuaries; and it is charged with carrying out specific programs authorized by the legislature.

Streambed Alteration Agreements (Fish and Game Code Section 1601 - 1603. In general, this law requires that any proposed project that will divert or obstruct the natural flow or change the bed, channel or bank of any river, stream or lake designated by the department, or use any streambed materials, must be reviewed by the department for its effects on fish and wildlife resources. If the department finds that the project will adversely affect fish or wildlife, the department proposes modifications necessary to protect fish and wildlife and negotiates with the applicant to have them incorporated into the project.

The 1601-1603 process is not clearly a regulatory process and is dealt with only as a negotiation. As a correlary, the department has no authority to refuse to enter into an agreement. Since the law is aimed primarily at fish and wildlife protection and not just water resource management, it is not safe to assume that riparian vegetation is protected, except where it grows in the streambed itself. Streambed alteration agreements do not reach over onto banks and levees except to control riparian vegetation in overflow areas. /49/

Thousands of agreements are negotiated each year (4,078 in 1981), the majority in connection with temporary stream crossings. It is difficult to define the extent of 1601-1603 jurisdiction in ephemeral streams and in tidal sloughs, especially since the latter can change course over time. The law offers in most instances the only direct instrument in California for protection of waterways and, to an extent, adjacent wetlands or overflow areas. Local governments are traditionally reluctant to manage these resources without state prodding; too often alterations are proposed and made before the department learns about them. /49/

Rare and Endangered Plants and Animals. The department has commenting and consulting authority on other state agency programs with respect to conservation of native plant species, including the identification, delineation and protection of habitat critical to the survival of endangered or rare native plants. The department also is required to notify landowners of the presence of plants, designated endangered or rare by the Fish and Game Commission. A landowner who has received such notice must let the department know at least 10 days in advance of any proposed change in the land use, to give the department an opportunity to salvage the plant. A number of plant species which occur in salt and freshwater wetlands are listed by the department.

A number of species on the state list of endangered and rare wildlife species inhabit coastal or inland wetlands. In spite of state and federal

law prohibiting taking, possession, and sale of these species, the Department does not have direct permit authority over lands on which their habitats are present. The most successful way of preserving critical habitat in private ownership has been through fee acquisition by the state through its Environmental Protection Program fund or by U. S. Fish and Wildlife Service through the Land and Water Conservation Act fund. /16/ The department has been acquiring critical habitat areas since 1970, including a number of coastal wetlands. /18/

Commenting Policies and Resource Planning. Department of Fish and Game personnel are regularly involved in review and comment on all forms of development-related processes in wetlands: State Lands permits and leases; EIRs, EISs; Corps of Engineers Section 10 and 404 permits; Regional Water Quality Control Board (RWQCB) Section 404 (NPDES) permits; and state water project developments under the Davis-Dolwig Act. Department of Fish and Game also comments directly to the Corps of Engineers concerning fish and wildlife aspects of federal flood control and navigation projects and other Corps public works projects.

The department consistently advocates the maintenance of existing fish and wildlife resources. If this goal cannot be satisfactorily accomplished, either project denial or approval with mitigative measures is recommended. In commenting on Corps public notices, the department is a stout defender of the state's basic wetland protection policy, particularly in negotiating mitigations. The department's position is regarded as intransigent by many, inexact and inconsistent by others, and a necessary obstacle to most landowners and would-be developers. While the department may not have been fully effective in creating a class of wetland resource lovers, it has been effecitve in setting aside, or otherwise preserving, thousands of acres of coastal and interior wetlands and in exacting compensation through mitigation and design revisions for projects involving many small areas of wetland.

The department has directed or assisted in preparation of a number of planning studies which not only document certain wetland resources in the state but also identify land use and development threats and set forth policies and recommendations for protection of the resource. The Coastal Wetland Series produced 21 reports on important coastal wetlands prepared in the 1970s; these provide useful information, but are advisory only. Two major planning reports were prepared with funding from U. S. Fish and Wildlife Service. Protection and Restoration of San Francisco Bay Fish and Wildlife Habitats (1979) and Plan for Protection and Restoration of Sacramento-San Joaquin Wildlife Habitats (1980) provide comprehensive inventories of the two areas and policies and specific guidance for protection of wetlands. Both are used by the Department as a basis for comment on applications under Section 10/404 in San Francisco and Sacramento Corps Districts, respectively. A third, earlier, report on Suisun Marsh protection set policy for BCDC's program. /93/

Fish and Game Law Enforcement. The department enforces fishing, hunting, and trapping regulations and laws, including screening of water diversions. It is responsible for the licensing of private pheasant clubs and shares in the enforcement of trespass and litter laws. The department also has authority to regulate hunting and to conduct wildlife management programs in Wildlife Management Areas.

Wildlife Conservation Board Acquisition Programs. An acquisition program is maintained by the Department of Fish and Game's Wildlife Conservation Board to preserve and maintain wetland habitat. The board is funded to acquire wetlands by purchasing fee title, leasing land from other agencies, or by purchasing easements. The department then sets up ecological reserves to protect rare or endangered plant or animal communities, or wildlife management areas where specific uses such as hunting and fishing are regulated. The CDFG has identified 19 coastal wetlands for priority acquisition in California. /8/

The state also co-manages, with the federal government, the Elkhorn Slough Estuarine Sanctuary, the Tijuana River Estuarine Sanctuary, and the Channel Islands and Point Reyes-Farallon Islands Marine Sanctuaries. Consistent with the intent of the Estuarine and Marine Sanctuary programs (CZMA), these areas are intended to serve educational and scientific purposes for future generations.

San Francisco Bay Conservation and Development Commission (BCDC)

The McAteer-Petris Act, which created BCDC in 1965, was amended in 1969 to authorize the San Francisco Bay Plan and make the commission a permanent agency. It had been recognized for some time that piecemeal filling had reduced the extent of water and intertidal areas of the bay by more than 75%, destroying also many feeding and breeding grounds of fish and wildlife and adversely affecting water and air quality of the bay area. The McAteer-Petris Act is significant in that it preceded most of the major federal and state environmental statutes as well as the "public interest" stage of the Corps' Section 10 regulatory program. In 1965, that program was not yet a recognized authority in San Francisco Bay wetlands. BCDC paved the way for an effective Section 10 and subsequent Section 404 regulatory program in the Bay. However, it is the Corps' program that has "saved" most of the diked historic tidelands from filling and development, not BCDC.

The San Francisco Bay Plan establishes two basic authorities for BCDC to exercise: 1) over fill in bay waters, up to the "line of highest tidal action;" and 2) over uses in a 100' shoreline bank extending around the bay and into some tributaries. BCDC also has jurisdiction over the extensive salt ponds in both north and south bay and over the diked managed wetlands of Suisun Marsh.

BCDC is empowered to issue or deny permits for proposed projects involving placing of fill or changing use of bay waters or developing the shoreline. Such fill should be authorized only when no alternative upland location is available, when the amount of fill proposed is the

minimum necessary to achieve the purpose, when harmful effects to water, fish and wildlife resources are minimal, and when the project benefits will clearly exceed public detriment. Projects should be limited to water-oriented uses or water-related industry, unless they are clearly projects designed to protect the resource, such as a marsh restoration. Applicants can anticipate a rigorous review by BCDC staff and commission, and, if a project that requires bay fill is approved, a minimum of one-for-one-acre mitigation plus substantial public amenities along the project's shoreline are placed as conditions.

BCDC was one of the first coastal areas in the U.S. to have an approved Coastal Zone Management Program pursuant to the Coastal Zone Management Act. Thus, BCDC comments on the consistency of federal projects or federally permitted actions with the bay plan (Coastal Zone Management Program). BCDC recently completed a 3-year study, funded in part by OCZM, to evaluate the relationships of diked historic tidelands that constitute a major part of the wetland resource around the bay to the bay itself. The study pointed out that these lands have been extensively modified by diking and in many instanced filled and developed. The objective of the study was to describe the ecological, agricultural, and recreational value of these lands, with the intention of seeking an extension of BCDC's authority over development on diked bay lands. /95/

Several alternatives were analyzed, including the development of a supplement to the bay plan covering diked lands, which would set forth policy for protection of habitat, agricultural, and open space/public access values and become certified by OCZM as a part of the bay's Coastal Zone Management Program. Another alternative considered was the assumption by BCDC of all or part of the Corps' 404 program, as specified under Section 404. After extended public hearings, the Commission voted on August 6, 1982, to extend their consideration of this matter until August 19.

The language of the Bay Plan and McAteer-Petris Act does not specifically refer to dredge materials or fill as pollutants, but fill is broadly defined to include structures of all kinds. The terms, "water-oriented" development and "water-related" industry set BCDC apart from the Corps and EPA, which require that projects demonstrate water dependency. In this and several other respects, the BCDC and Corps permit processes are duplicative without being congruent. BCDC covers a wider range of activities than the Corps but authority does not extend into diked lands. BCDC's authority extends to the "line of highest tidal action," but in the absence of local tidal records that line must be established on a case-by-case basis. The Corps' jurisdiction under Section 10 is tied to elevations and under Section 404 to various forms of wetland evidence. BCDC is less rigorous on the criterion of water dependency, occasionally having contested a Corps decision (e.g., Hamilton Air Force Base in Marin County). Mitigation requirements are not always alike between the two agencies. In short, applicants facing multiple permit processes, plus the agency comments that each elicits, regard bay shore regulation as excessive and time consuming.

Suisun Marsh Preservation Act. The California Legislature passed the Suisun Marsh Preservation Act of 1977, after designating BCDC and Department of Fish and Game to work together to develop a plan for protection of the marsh and acceptable means to implement it. Policies and programs are set forth in the Suisun Marsh Protection Plan. The plan is administered by local authorities but is within the jurisdiction of BCDC, which retains right of appeal.

The protection plan established boundaries delineating primary and secondary management areas for regulation of appropriate uses. Implementation of the plan required local governments and districts having jurisdiction over various portions of the marsh to prepare Local Protection Programs (LPPs) to bring local policies and ordinances into

conformity with the provisions of the preservation act and the policies of the protection plan. Upon completion of the LPPs, local agencies submitted their programs to BCDC for the commission's review and final certification. /107/

Initially, each local jurisdiction prepared a detailed work program which could serve as the basis for federal coastal zone management planning assistance grants. Local planning efforts were coordinated by the Suisun Marsh Local Protection Program Technical Advisory Committee, made up of the county, cities, special districts, BCDC, etc. This process ensured cooperation among local agencies, private landowners, and other private interests, the principal one being duck hunting clubs in the marsh. There was continuing review and comment by state and federal agencies and the public throughout the development of plan components.

Implementation now consists of a series of local components in which policies, ordinances and regulations of each local agency guide uses and operations within and adjacent to the marsh. For example, Solano County developed new marsh protection policies, incorporating them into the land use, resource conservation and open space and scenic roadways elements of the Solano County General Plan. The county also developed ordinances for the protection of water quality and riparian habitat within and adjacent to the marsh; a grading and erosion control ordinance; and an ordinance regulating development directly adjacent to designated watercourses within the county. The county also amended their zoning regulations to include the specific designations of Marsh Preservation District, Limited Agricultural District, and Water-Dependent Industrial District for appropriate parts of the marsh.

With the Coastal Act, this is one of the few laws in California that protects a specific area of wetlands, riparian vegetation, and streams. Its effectiveness in protecting the largest wetland area left in the state is in large part due to the interest and political pressure of waterfowl hunting interests. This presents one of the few successful examples of private-public initiative and collaborative planning in California wetlands.

Humboldt Bay Harbor Recreation and Conservation District

This district, created in 1970, was authorized by the voters in 1973 and is similar in function to BCDC. Its jurisdiction extends over all tidelands in Humboldt Bay to the mean higher high water line and the District must permit all developments in this zone. The Harbor District has a five-member Board of Commissioners. The general mandate of the District is to promote development in and around Humboldt Bay and to conserve and protect the Bay resources. Conservation and development are considered of primary importance; promotion of recreation is a secondary purpose. The Harbor District has permit, planning, and leasing authority over areas under its jurisdiction and may engage in capital construction. Part of the District's mandate is to conserve and protect resources such as wildlife habitat, open space, wildlife and fish, and aesthetics of the area. The District must regulate use and control of pollution, dredging, and filling. The District's tideland grant is a multi-purpose grant. The District may also exercise the power of eminent domain. /118/

California Coastal Commission

In 1972, 55% of the voters approved Proposition 20 and created the California Coastal Zone Conservation Commission. By 1975, the regional and state commissions had issued a 443-page California Coastal Plan designating a coastal zone and containing findings and policies concerning topics from natural habitats and wetlands to energy facility siting/criteria along the 1,000+ mile coast. /40/

During the past ten years the regional commissions and their successors, under the California Coastal Act of 1976, have processed more than 50,000 permit applications for development projects within the coastal zone, following detailed statutory, regulatory, and judicial guidelines. California communities have been preparing local Coastal Programs (LCPs) which apply coastal zone management policies at the local level. /40/ Most of the LCPs are in process; some are complete.

The Coastal Plan addresses a number of land use questions along the coast with the intent of ensuring the protection of scenic and visual qualities of the coast, minimizing alteration of natural land forms, and preserving and protecting environmentally sensitive areas. Within this broad charge, the Coastal Act is concerned with protecting agricultural lands (which serve as open space), developing coastal access for the public, siting critical energy facilities appropriately, identifying hazard areas, expanding commercial fishing and recreational boating, and protecting wetlands from diking and filling.

The terms "wetlands," "biological productivity," "marine resources," "environmentally sensitive habitats," are cited and defined in a number of sections in the statute, along with policies for development activities such as dredging and filling. It remained for the Commission to develop more specific guidelines. The Interpretive Guidelines for Wetlands and Other Wet Environmentally Sensitive Habitat Areas were adopted early in 1981 after two years of study and public input. The guidelines were designed to assist local governments in protection, restoration and mitigation efforts in wetlands and adjacent areas undergoing development. In practice, they have engendered considerable local controversy.

The guidelines contain three important sections: technical definitions for environmentally sensitive habitats, including wetlands and riparian habitats among others; permitted development and conditions in these areas; means of restoration and maintenance of wetland areas. The guidelines elaborated on the statutory definition of wetland in the Coastal Act (Table 1), drawing on hydric soils and hydrophytic plant species criteria developed by U. S. Fish and Wildlife Service to provide a more precise basis for identifying wetlands.

The guidelines also establish standards for siting development in or adjacent to wetlands, and suggest appropriate mitigation measures, such as setbacks, buffer areas, landscaping, erosion control, and drainage control.

Protection of environmentally sensitive areas is a recurring theme in the statute, reinforced by the guidelines. The most controversial

sections of the statute, however, are: 1) Section 30411, which lays out a process for identifying "degraded" wetlands in the Coastal Zone (i.e., altered by a variety of human activities), evaluating their restorability to tidal access, and specifying the proportion that must be restored (75%), preferably in conjunction with a boating facility or comparable development; 2) Section 30233(3), which specifies that the boating facility may occupy no more than 25% of the total wetland area to be restored; and 3) Section 30607.1 which states that if fill is required in development, the area shall be mitigated through some form of compensation to achieve equal or greater biological productivity.

Taken out of context, the development process which the statute envisions in areas of degraded wetlands is fairly stringent and has been regularly contested by land developers. In the context of wetland losses, particularly on the Southern California coast, the clear intent of the Act is to halt the rate of loss and, where feasible, restore the resource in small increments.

The central points of controversy are, first, the identification of wetlands, and, second, the determination of degraded condition. Much scientific expertise in soils, marsh plant ecology and physiology, hydrology, etc. has been brought to bear on these questions in California coastal wetlands, without resolution. This suggests that somewhere between the precise technical definitions of the scientist and the broad, necessarily imprecise definitions of the politician, lies the reality of the "negotiated" definition that is most acceptable to all parties. There is no one definition of wetland that will fit all cases in California.

The regulation of coastal wetlands by the Coastal Commission presents perhaps the most evident overlap with the Corps Section 404 program. Critics of "excessive regulation" tend to confuse the demands and effects of the two, viewing coastal regulation as being in general excessive, fragmented among agency levels, time consuming, and revealing chronic conflicts between resource protection and urban uses such as

housing, flood control, recreation, transportation, and energy facilities. Implementation is on a permit-by-permit basis with no evident, overall plan for regional wetland resources. Particularly the Coastal Act (and other regulatory programs) are viewed as fostering confusion between resource protection and "no growth" objectives. /65/

It is particularly important on the Southern California coast to distinguish between the benefits and problems of wetland protection as carried out by the Section 404 program and as implemented by the Coastal Act. The two are somewhat duplicative, as in San Francisco Bay. Unlike the bay, however, on the coast it is the state side of regulation that is more rigorous than the federal. The principal basis for interaction between the two processes is through the requirement that federally funded or permitted actions demonstrate consistency with the Coastal Commission's Coastal Zone Management Program to the extent practicable.

California State Coastal Conservancy

Established by the California Coastal Act of 1976, the State Coastal Conservancy has as its broad goals the protection of agricultural lands, restoration of coastal zone areas, and enhancement of coastal resources. The Conservancy's program for accomplishing these goals differs in significant ways from the planning and regulatory functions of the California Coastal Commission.

The direction of the Conservancy is to protect resources through creative means, such as working with local and state agencies, using their planning tools and state funds to work out restoration projects which produce both private revenues and public benefits. Typical approaches involve a mixture of local zoning and regulation, tax incentives, redevelopment concepts, and acquisition of a variety of fee and less-than-fee interests in sensitive wetland areas.

The Conservancy has the authority to acquire, lease, sell, or exchange property and interests in property, make grants to state and local agencies to acquire interests in or restore and enhance coastal areas. It may also make loans and grants to the Department of Parks

and Recreation to reserve lands for public purposes or develop public accessways to the coast. This authority is supported by a $10 million bond act for general acquisition purposes, $5 million for conservancy action in the San Francisco Bay area (one-half to be used for wetland enhancement), and $20 million for LCP improvement relating to coastal access, and preservation and rehabilitation of wetlands. /2/ The Conservancy also receives funding from the Office of Coastal Zone Management.

Examples of the actions completed or anticipated by the Conservancy through 1981 were:

Agricultural Land Transactions. 92 acres pending purchase in the Central Coast Region.

Significant Coastal Resource Areas. Acquisitions Completed:

| | | |
|---|---|---|
| North Coast Region-- | 76 acres | 0.7 acres dedicated |
| Central Coast Region-- | 2.24 acres | |
| South Coast Region | | 168.5 acres dedicated |

Anticipated acquisitions. Through December 1981:

| | |
|---|---|
| Fee title acq. --- | 316 acres minimum |
| Partial interests acq. --- | 261 acres minimum |
| Open space preservation provide for --- | 3,915 acres minimum |
| Miles of trails established--- | 9 miles minimum |

Grants awarded.

Total number of grants awarded--17
Access grants awarded-- 13
Urban waterfront grants awarded- 4 (Santa Barbara, Arcata, Del Mar, Fort Bragg)

Value of grants awarded-- Total: $1,029,971; access $158,971
urban waterfront $871,000 /10/

Several specific marsh restoration projects are either planned or completed: the Bracut Marsh restoration in Humboldt Bay, which compensated for the filling of some of the City of Eureka's urban "pocket" marshes; San Diegito Lagoon restoration of 85 acres of a 200-acre degraded lagoon and marsh system; and Los Cerritos restoration of 129.5 acres of a 170-acre degraded wetland presently used for oil extraction.

The philosophy of the Conservancy Director, Joe Petrillo, is that one "cannot protect resources by creating a class of resource haters." The Conservancy is in the fortunate position of having funds with which to accomplish some of its goals, unlike its "sister" agencies, the Coastal Commission and BCDC. How judiciously and effectively the funds will continue to be allocated remains to be seen. In the meantime, the Conservancy has made substantial progress.

State Water Resources Control Board and the Regional Water Quality Control Boards

The State Board and nine Regional Boards were designated in 1973 as the state agency responsible to exercise powers set forth in the FWPCAA, and later, the CWA. The Boards are also responsible for exercising powers in the state Porter-Cologne Water Quality Control Act, amended 1969.

Section 401 of the Clean Water Act empowers the state to require certification that federally permitted activities involving discharge of fill into navigable waterways will meet state water quality objectives, set forth in basin plans. The Regional Boards, acting as agents to the State Board, may issue certificates or place conditions on certification of a Section 404 permit application to ensure that the project will comply with effluent limitations and standards in the Clean Water Act, EPA regulations, and with state standards. /102/ This is one of the important elements of state-federal interaction in the Section 404 Program.

The Regional Boards also issue NPDES waste discharge permits under Section 402 of the Clean Water Act. The program is administered by the Regional Boards in conjunction with state waste discharge requirements established by the Porter-Cologne Act. The National Pollution Discharge Elimination System applies to point-source discharges of such materials as solid waste, sewage, heat, industrial, municipal and agricultural, waste. The NPDES permit program applied to waters of the United States

as defined by Corps and EPA regulations, that is, including adjacent wetlands.

The State and Regional Boards have independent authority over water quality, including discharges of dredge and fill material in wetlands. The Porter-Cologne Water Quality Control Act has broader authority than the federal law. The Porter-Cologne Act established the State and Regional Boards and granted the State Board the power to formulate state policy on water quality, administer technical research, and enforce waste discharge requirements. The Regional Boards also administer self-monitoring systems for waste dischargers. /102/

The Porter-Cologne Act is the only statewide law that presently functions indirectly to protect wetlands. The primary responsibility of the Boards is protection of water quality. Wetlands have received protection as an indirect recipient, in part because of the Boards' dual involvement with the Clean Water Act and the state wetlands policy. Where water quality is clearly not an issue in wetlands, the Porter-Cologne Act has limited application.*

Section 404 (g-k), CWA, provides for delegation to the states of a 404 program, qualified by a number of conditions, such as EPA overview and geographic scope limited to certain waters not covered by federal navigation servitude. No state has fully accepted this offered delegation; Nebraska and Michigan have accepted EPA funding for pilot projects to assume 404. The California State and Regional Boards are the most likely candidates for delegation if California chose to pursue it. /102/ The Porter-Cologne Act would require amendment to allow Board regulations in the appropriate areas; but in other respects, the Boards and the Act possess most of the necessary administrative experience and state statutory support, respectively, to assume the program.

Two drawbacks are evident which discourage this possibility: 404 permits have become land use issues rather than water quality issues. The Boards are at present unaccustomed to dealing with land use problems and do not have planning staff. Federal delegation of 404 is not backed up by

funding. It is unlikely that the Boards would administer the combined 401, 402, and 404 programs without additional funding. /102,53/

State Reclamation Board

The Reclamation Board, established in 1911, is primarily concerned with maintenance of flood-carrying capacity of the Sacramento and San Joaquin Rivers, their tributaries, bypasses, and overflow channels and basins. The board's main function is to participate with the federal government in the completion of federal levee and channel flood control projects, providing project assurances and acquiring lands and rights-of-way for the projects. The board also is responsible for the integrity of the federally constructed levee and channel flood control systems in the Central Valley. /21/

The Board regulates the placement of fill only to the extent that it affects flood-carrying capacity of a waterway. The Board also establishes and enforces standards, such as for vegetation encroachment on levees, and is required to give full consideration to fish and wildlife habitat among other things. Thus, riparian vegetation o. federal project levees is encouraged with strict standards and to the extent that it is compatible with flood control requirements. The inability of the Board to enforce any standards on private levees severely limits its influence in the Delta; its geographic scope removes it from significant areas of riparian vegetation outside the Central Valley and Delta. /21/

LOCAL GOVERNMENTS

There are many communities and counties in California that have within their jurisdictions either shorelines, bayfront lands, agricultural "wetlands," and so forth. Even without the "federal presence," some are responsible resource managers. Local governments in California have available to them an array of planning instruments (general plans,

zoning ordinances, etc.) and tools (technical data, review procedures) for protection and management of natural resources. Their influence over wetlands is constrained in part by local political priorities, in part by an inadequate body of policies and implementing means, and in part by inconsistency in applying policies and regulations.

Local land use management in California begins with general plans. General plans are implemented by zoning ordinances which regulate the use of lands within the local governments' jurisdictions. The elements of the local general plan (Government Code, Section 65000 et seq.) that affect protection and/or preservation of wildlife habitats, including wetlands, are contained in the land use, open space, and conservation elements:

- The land use element delineates the distribution, location, and extent of development and land uses;
- The conservation element addresses "the conservation, development, and utilization of natural resources;"
- The open space element defines provisions for open space for the preservation of natural resources, among other things.

Most California cities and counties have adopted policies within the conservation and open space elements of their general plans of special area plans for the conservation of wildlife habitats such as wetlands. Policies addressing habitat protection vary significantly, however, often stating that wildlife resources (in general terms) should be protected, without providing precise guidelines and action programs.

In addition to state planning law, local land use decisions are directed and/or guided by several other statutes, including the California Environmental Quality Act. The State Subdivision Map Act requires that a subdivision map be reviewed and approved by the appropriate local government for all projects creating five or more parcels of land or condominiums. Local governments are required by state law to deny tentative or final subdivision maps, if the finding is made that

the subdivision and proposed improvements are likely to cause damage to fish or wildlife habitats. Howevever, the State Subdivision Map Act does not clearly define either the habitats that are addressed by the act nor the studies necessary to ascertain impact. In general, local governments have not incorporated adequate criteria or habitat descriptions into their subdivision ordinances to implement the state law. /21/

The California Land Conservation Act of 1965 (Williamson Act) was established to relieve the tax burden on land owners engaged in commercial agricultural operations through signing of contracts to maintain "agricultural preserves." Thus, lands under contract are appraised by the local assessor's office for agricultural purposes rather than at ordinary market value. The objective is to preserve the maximum amount of a declining resource, agricultural land. The contract period is 10 years, renewable annually unless cancelled through a public hearing process.

In 1969, the act was amended to include areas of great importance to wildlife, as well as other open space lands. The habitat areas must have been designated important for the protection or enhancement of the wildlife resources of the state. Included in this definition are salt ponds, managed wetland areas (e.g., areas maintained for waterfowl hunting), submerged areas, and open space.

The Williamson Act does offer a means to reduce landowners' taxes on wetlands, but since most wetlands and riparian corridors are already taxed at a low rate, there is not a significant relief. The amendment, to be effective, also requires the local legislative body to make findings of "great importance" of the habitat which is being protected.

Using these and other tools, a few local governments have become effective wetland resource managers. Several major provisions and practices are evident in their local planning and permit processes:

- inventories of significant wetland areas with specific general

plan policy protections and inclusion of the inventory in the open space or conservation elements;

- local subdivision ordinances which require:
  - habitat impact and mitigation assessment;
  - open space dedication of wetland habitat areas;
  - performance bonds for development within wetland areas;
  - denial of tentative and final maps for projects shown to have potential significant adverse impact on the environment and for which mitigation measures are not adequate;
  - effective use of conditional use permits, the most common tool which local government currently has to protect habitat from the impact of development;
  - use of an implementing "overlay" zoning district to protect significant areas, such as a "resource management district," or a "wetland conservation district," subject to conditional use permits with clearly stated criteria and requirements for habitat protection and mitigation for damaged or lost areas.

An informal survey of 32 San Francisco Bay Area cities and counties with identified diked baylands revealed that five or six had adopted some form of diked bayland protection. Others have use restrictions attempting to protect agricultural uses. Some local governments have Williamson Act contracts for some of the baylands but these may be terminated with appropriate notice. Sixteen cities and counties have no provisions that protect baylands from being filled or otherwise altered. Local governments in California will not likely have the planning resources to prepare the studies, plans, and ordinances necessary to impose additional restrictions to protect diked baylands. /102/

The best examples of local implemention of resource protection policies are contained in the Local Protection Programs for Suisun Marsh Protection Plan and in Local Coastal Programs in the California Coastal Zone. In both cases, local agencies were directed by state law to prepare the programs, and in both cases they received major funding for necessary studies.

# EVALUATION OF EFFECTIVENESS

INTRODUCTION

The major factors that have affected the wetland and riparian resources in each region of California, and the continuing pressures on these resources, translate into the needs and activities of any regulatory system and program that seeks to achieve appropriate protection. The present regulatory framework of state and federal agencies exists as a patchwork of protection to riparian and wetland areas and over the activities which influence their continued existence. The Corps of Engineers Section 404/10 program is the primary federal regulatory authority and is thus the centerpiece of our evaluation. As applicable, state and other programs are also evaluated, especially as they relate to the Corps.

Two attributes of the Corps program are of particular importance: 1) the inherent jurisdictional scope and authority over wetlands and "fill" activities; and 2) the manner in which the program is administered by each district. Examination of each Corps district reveals the significant inadequacies, benefits, and possible excesses. Other programs that fill in gaps or overlap with the Corps program are also evaluated.

This evaluation could not entail the massive review of permit applications that a statistical analysis would require. Instead we have interviewed the primary actors in wetlands regulations, held workshops, reviewed case histories of selected Corps permit actions and analyzed other important regulatory programs. Through this review, we developed a set of criteria by which the overall effectiveness of regulatory programs might be evaluated. These criteria include:

- gaps in geographic areas and wetland types covered and activities regulated;
- inconsistencies between federal-federal and federal-state programs;
- benefits in terms of wetlands protected or restored;
- overlaps in permit procedures and administration;
- excesses in scope or interpretation of jurisdiction;

- monitoring and enforcement of conditions of permits and compliance with program;
- coordination among applicants and agencies;
- nationwide permits and statutory exemptions.

The Corps district evaluations present examples of both typical and problematic actions, concluding with a general summary of the problems and effectiveness of each district.

SAN FRANCISCO DISTRICT

The San Francisco Corps district has jurisdiction over the Bay area west of the Antioch bridge and the coastline from the Oregon border to San Luis Obispo County and eastward to encompass the limit of the watersheds draining westward to the coast. The Klamath Lakes Basin (partly in Oregon) is also included.

OVERVIEW OF OPERATION

The San Francisco District is one of the smallest districts in the nation but has instituted a number of "firsts" in their regulatory program. Some of these are outlined below:

"Environmental Benchmarks" of San Francisco District's Regulatory Functions Program

| Date | |
|---|---|
| 11 June 1971 | First Corps district to extend Section 10 regulatory jurisdiction to Mean Higher High Water, (MHHW). |
| December 1971 | First Corps district to start with regular aerial surveilance. |
| 18 January 1972 | First Corps district to exert Section 10 jurisdiction in unfilled areas below former MHHW interior of levees. |
| 15 May 1972 to present | One of the first districts to confine dredged material disposal to certain locations in San Francisco Bay. |
| 1972 to present | One of the first districts to initiate an innovative public involvement program. |
| October 1975 | First Corps district to publish a simplified, color drawing for public use of expanded regulatory jurisdiction. |
| January 1976 | First Corps district to initiate in-depth training on wetlands identification in response to our Section 404 jurisdiction. |
| 6 July 1976 | First Corps district to implement "reasonable" approaches to exercising Section 10 jurisdiction behind levees. |
| September 1976 to present | One of the first districts to initiate broad, in-house training and seminars to apply an interdisciplinary approach to regulatory program. |

| | |
|---|---|
| January 1977 | One of the first districts to implement the change-detection system in surveilance program. |
| 1 July 1977 | First Corps district to issue a public notice (PN) that contains both a summary of the preliminary environmental assessment and a statement of the District Engineer's preliminary position on the proposed activity. By putting the applicant and public on notice of the District Engineer's preliminary position, time, anxiety and expense are saved. The DE's preliminary position eliminated the need to prepare a time-consuming and costly Environmental Statement and encouraged the applicant to modify the project or consider alternatives to minimize the foreseen environmental impacts. |
| 27 April 1978 | First Corps to deny permits--six in all--because of the potential cumulative impacts on harbor seals. |
| May 1979 | First Corps district to develop a joint Corps/Regional Water Quality Control Board Public Notice for <u>every</u> Section 404 permit application received for San Francisco Bay. The Regional Water Quality Board estimates an annual savings of $10,000 to the applicants. |
| 1979 | In order to reduce duplication of effort and permit processing time, the San Francisco Regional Water Quality Control Board has agreed that the Corps take the lead in routinely evaluating dredging and open-water disposal impacts in San Francisco Bay. |
| The immediate future | Develop with the U.S. Environmental Protection Agency a joint Corps/EPA regional wetlands policy tailored to the public interest within the district. |
| | Develop a composite application booklet with flow chart for applicants, whereby they would know which agencies to see. |
| | Increase public participation program by providing the public with opportunities such as workshops to have a significant input on formulating District regulatory policies. |

An overview of the district's permit program shows the majority of projects to be located in the bay area. Most permit actions are for fill for residential and commercial uses or dredging to maintain harbors or create new ones; diking of wetlands for agricultural reclamation is the major activity in the Klamath area, and reclamation for agriculture, levee maintenance and marina development permits occur along the coast. Applications are modified an projects often scaled down to avoid wetland impacts. This district has used pr application consultations and coordinates closely iwth the reviewing agencies.

This district is also noted for its detailed public notices and consultations with applicants to resolve problems. They have also stated the unlikelihood of project approval to applicants proposing development in obvious non-conformance to local and regional plans and regulatory policies. /152/ Projects which would result in wetlands loss are almost always required to mitigate or compensate as a condition of their permit approval. Mitigation agreements or compensation plans are usually worked out between the applicant and the reviewing agencies (USFWS, NMFS, EPA, CDFG, BCDC and SLC. The Corps acts as an arbitrator and organizer, and then is called upon to make the final decision. /152,167,178,201,205/

Only 1-2% of all projects are denied; however, on occasion permit decisions are elevated. Ten percent of all permits elevated nationwide originate from the San Francisco District; only two to three have reached the division level. Elevations have resulted in large part from objections raised by the U. S. Fish and Wildlife Service to projects which are not water dependent, yet proposed for wetland and tideland areas. /159,167/ Most lengthy time delays in processing have been attributed to applicants who submit inadequate permit materials or revise projects during the comment period. The reviewing agencies have not been singled out for causing excessive delays. /152,159,167,178/

Enforcement of permits and identification of illegal fills is a problem in the San Francisco District. Around the bay concerned citizens, agency personnel, and conservation group members report many of the illegal fills. But in the less populated coastal areas and Klamath Basin, wetlands are not as well inspected. The District does a computer review of shoreline changes comparing aerial surveillance data collected twice a year. They have also released a help-to-enforce brochure for general public information. /159,167/

When fills without permits are discovered, an after-the-fact permit public notice is released and appropriate mitigation usually arranged. Cease and desist orders are also issued. The overlapping jurisdiction of the Coastal Commission and BCDC has stimulated greater surveilance in these areas.

Non Corps agency personnel, conservation groups, and applicants have all pointed to the arbitration role which the San Francisco District takes as a useful means to resolving conflicts between the applicants'

plans and the mitigation requirements of the fish and wildlife agencies. Although this impression is not shared unanimously amongst all of those involved in the 404/10 permit process, the San Francisco District has managed to circumvent direct conflict with other agencies and applicants. /152,178,182,203b, 205/

The San Francisco District regulatory functions branch has stated their basic philosophy in administering the section 404/10 program:

> To manage our waterways and wetlands such that it reflects the national concern for their protection and wise use.
>
> We do not see our program as pro-hard hat or pro-white hat but rather a program that insures man's use or non-use of our water resources that best reflects, as much as possible, the interest of society.
>
> Our ideal goal is to create a "win-win" situation: a win situation for the developer and a win situation for the environment. We try to encourage a development design that considers its impact on the environment - a "design with nature" attitude.
>
> In times past we have been severely criticized as a "rubber stamp outfit". As our critics have become more familiar with our program, they've come to realize that for most sensitive permit actions, the project that we issue a permit for is not the same project that was initially applied for. Fortunately, most applicants, no matter how controversial their proposed projects are, are somewhat sensitive to their environmental surroundings and are sympathetic to reducing project impacts. As a result, with our encouragement and suggestions, sensitive projects are modified through: 1) mutual agreements, 2) alternative plans, 3) compensation for lost resources, and/or 4) special conditions in our permits.
>
> We do not advocate no-growth; we advocate balanced planning. taking into consideration many public interest factors.

## SIGNIFICANT BENEFITS AND INADEQUACIES

Several case studies will illustrate that both benefits and inadequacies are present in the district's program, the positive regulatory philosophy not withstanding.

*Ignacio Industrial Park Unit 3*

Ignacio Industrial Park Unit 3 in Novato, Marin County, exemplifies the San Francisco District's role as arbitrator in the permit process. It also illustrates that interactions amongst applicant, federal, state, and local levels can extend over a considerable period of time, resulting eventually in an "acceptable" project. This particular case occurred at a time of transition when the San Francisco District was also trying to incorporate the changing direction of the Corps 404 regulatory program and other wetland policy directions, including the state's. This project, as originally conceived in 1975, would excavate 455,000 cubic yards of material from a 113-acre site on one side of a nearby slough in order to fill a 45-acre parcel on the other side, including portions of the slough. The excavation would have lowered the elevation of the borrow site to -10 ft. mean sea level and required the dredging of an existing 26-acre ponding area to 16 feet lower than its present elevation.

The Corps received the completed application in February 1976 and released a seven page public notice, including three drawings, in March. The site was on diked former wetland, largely below mean sea level, adjacent to a tidal creek (Novato Creek). Wetlands vegetation was also present over most of the site. The Corps determined jurisdiction under both Section 10 and Section 404. The area was not under BCDC jurisdiction. The State Lands Commission and Regional Water Quality Control Board negotiated a separate boundary agreement and a NPDES permit. Marin County had prepared an EIR on the project in 1975. Over the applicant's complaints, the Corps prepared a draft EIS in 1977 on the project and another adjacent permit action. The Corps in their findings of fact on the permit described the history of the application and the rationale for their actions. Some of the points are significant:

On the state and local level, the applicant had gift deeded 113 acres of the project site to the Marin County Flood Control and Water Conservation District in December 1975 for flood control and wildlife habitat purposes, based on the approval of the project. This land donation

was a part of the good faith mitigation negotiations for the project, begun in mid-1975, between the applicant, the CDFG, and the Flood Control District. Draft agreements between these three parties for the management of the 113-acre site were circulated among them for review in late 1976 and early 1977. In April 1978 CDFG's Region 3 office stated that the subject project was not water-dependent and did not qualify for an exemption to the State's newly-adopted Basic Wetlands Protection Policy (September 1977). The applicant argued that, in gift deeding the 113 acres to the Flood Control District prior to the adoption of the new state wetlands policy, the applicant had proceeded in good faith mitigation negotiations with the CDFG, and that an exception to the state's policy should be granted. The Director of CDFG wrote The Resources Agency concurring with the applicant's position. Accordingly, The Resources Agency withdrew objections in September 1978.

During the inspection of the project site in June 1979 the District Engineer expressed his concern over the proposed excavation and/or filling of over 100 acres of important salt marsh wetland. Several Corps personnel and representatives of the USFWS, EPA, and CDFG mapped the entire 163-acre project site, particularly its important wetland areas. Representatives of the applicant met with the District Engineer and his staff to dicuss these problems. /123/ On the basis of information exchanged at that meeting, the applicant was advised to submit to the Corps a revised project proposal involving no excavation or fill in the wetland areas.

United States Fish and Wildlife Service noted that the project was not water-dependent, citing recent (1977) Executive guidelines supporting wetland preservation (E.O.11990). USFWS also indicated that, because of previous efforts of the applicant to follow through on these agreements, The USFWS would not request that the matter be forwarded to a higher authority for resolution should the Corps decide to issue a permit.

The EPA considered the project "unacceptable" in terms of the 404(b) guidelines. They foresaw the "permanent loss of approximately 125 acres of wetlands and their value to wildlife." They recognized the existence

of practicable alternatives such as a reduction in size of the proposed fill to avoid the loss of wetlands, and they found "no water-dependent justification." The Corps transmitted EPA's letter to the applicant, noting in its coverletter that it concurred with the EPA that the project as proposed did not meet the Section 404(b) guidelines with respect to the filling of wetlands.

During this period of negotiation, the applicant continued to indicate willingness to work with the agencies to achieve a mutually agreeable solution. On 30 July 1979, the Corps received from the applicant the blueprint of a scaled-down project proposal, revised to meet the Corps' concerns. This blueprint was found to be acceptable.

A meeting was held on 20 September 1979 between the Corps, the applicant, the CDFG, the Mosquito Abatement District, and the Flood Control District to help finalize a draft agreement for flood control and wildlife habitat management of the 113-acre parcel deeded to the latter agency.

The Corps issued their permit in October 1979.with no outstanding objections from reviewing parties. If implemented as originally proposed, the project would have eliminated, through excavation and fill, 86 acres of salt marsh vegetation and slough identified as "important wetland areas." The revised project proposal left these areas intact. The revised proposal calls for the excavation of approximately 320,000 cubic yards of material from limited areas of the 113-acre site referenced above and the placement and compaction of this fill material on the above referenced 36-acre site located on the west side of the diagonal slough. As revised, the project entailed excavation of 320,000 cubic yards of material solely from a 6-acre knoll and from two small artificial sloughs created to connect the pond (to be formed by the knoll excavation) with existing on-site sloughs. The only "important wetland areas" to be filled would be a size not to exceed one acre to be used as a wildlife habitat island. The 36-acre fill site was reduced from the 45 acres originally

proposed in order to avoid the filling of "important wetland areas." The 36-acre site, then comprised of some 26 acres of transition/upland vegetation, and approximately 10 acres of mixed transition and freshwater marsh/riparian habitat, was developed as a light industrial park. /123/

A number of gaps have been identified in the Corps program. These fall into two categories: unregulated or exempt activities affecting wetlands, and differences in jurisdictional definitions and interpretations. Nationwide permits allowing fill of isolated wetlands and areas above 5 cfs median flow have not presented a great problem in the San Francisco District. The majority of the District's wetland and riparian resources do not fall under either of these two categories. The definition of fill does present problems. A case involving the disposal of logging slash into wetlands illustrates this dilemma.

*Warm Springs Development International Industrial Park*

Warm Springs Development International Industrial Park in Fremont along the south bay shoreline exemplifies the Corps' role as arbitrator. This case study demonstrates an improvement in the regulatory process and negotiation of mitigations over the previous case. In addition, the overall willingness of the applicant to work with the wildlife agencies is apparent.

The applicant applied for a Corps permit in October 1979, revised plans in December 1980, and submitted a completed application on May 7, 1981. The applicant requested abeyance to allow for meetings with involved agencies to refine plans. The public notice was issued May 21, 1981 and included a six page discussion of the project and its impacts, illustrated by three pages of diagrams.

The project was an industrial park proposed for 225 acres partially covering a diked historic wetland, combined with the restoration to tidal action of 257 acres of diked wetland. The restoration area would be excavated to provide fill for the development. In addition, the project designated a 25-acre pkckleweed stand for preservation and the creation of two stormwater retention basins totaling 40 acres. This restoration

development plan was devised after consultation with concerned agencies and and the Corps and several studies and was further refined to reflect comments on the public notice and response to the City of Fremont's EIR on the project. The applicant, Fremont International Partners, cooperated and consulted with the regulating agencies throughout the permit process. /167/

The Corps of Engineers 404/10 jurisdiction extended from the bayward edge to the +2.8 Mean Sea Level elevation, the historic mean high water line. Approximately half of the development area and all of the restoration area were within jurisdiction.

The proposed industrial site, although former wetland, was most recently in agricultural use with some portions containing up to 50% cover of pickleweed. The restoration site, primarily pickleweed and other halophytic species, was seasonally flooded. Under its modified condition the restoration area was of marginal quality to wildlife. According to the plan, the 25 acres of high quality pickleweed habitat would be enclosed by dikes to preserve it as salt marsh harvest mouse habitat. The retention basins upland of the levee and adjacent to the restoration area would collect floodwater runoff. The restoration area, as originally proposed in the public notice, would be excavated to a depth of -4 feet Mean Sea Level.

The wildlife agencies objected to the project as conceived, and numerous meetings were held by the Corps to refine the concept. The application was then modified to incorporate these changes. The revised plan contained proposed mitigation measures for review by the objecting agencies. The agencies withdrew their objections based on the revisions and eventually favored the project; in spite of a net loss of 14 acres of wetland, the overall habitat would be enhanced. The principal revision changed the bottom elevation of the borrow area, which would be too deep for wetland plants, to three sloping basins, thereby enabling the establishment of wetland vegetation and a more varied habitat. The property owners

stated their intention to disc the pickleweed and return the diked-off wetland to agricultural use if the project was not approved. Neither of these actions requires a 404 permit.

The Corps received fourteen comment letters on the public notice, mostly from public agencies. Both the EPA and USFWS requested time extensions of 10-30 days for commenting. The only agency which had substantial objections to the final revised project was the State Lands Commission. The problem is typical of all applications for permits in historic tidelands around the bay. The applicant was required by SLC to locate lands to exchange with SLC for project lands that were determined to be subject to the public trust (filled or unfilled historic sloughs and meanders). This problem was resolved before issuance of the permit.

The Corps issued the permit in February 1982 after a concurrent permit was issued by BCDC. BCDC jurisdiction overlapped with the Corps' jurisdiction over much of the property; therefore BCDC was involved in most of the permit negotiations. BCDC supported the conditions imposed by the Corps permit, but required that public access be granted along the project levees and that two public staging areas be provided for parking and picnicking near the levee as consistent with their policies. The restored marsh would be dedicated to the California Department of Fish and Game for management.

The Corps summarized the overall project:

> "The marsh restoration project would convert lands presently considered marginal habitat, and which could be eliminated through increased farming and grazing, to a high quality habitat.
>
> "Besides providing a valuable addition to the surface area of the bay, the proposal would greatly enhance the ecological and environmental values of the site, public benefits would be gained through fish and wildlife resource renewability, wetlands restoration and development, open space, recreational, scenic, and other environmental values." /122/

*Modoc Lumber Company Slash Disposal*

In 1980 an application in the Klamath Basin area called for placing 16,600 cubic yards of unusable wood products over 3.4 acres of wetland at Lake Ewauna near Klamath Falls, Oregon. Modoc Lumber Company, when confronted with a cease and desist order from the Corps, applied for an after-the-fact permit. A public notice was issued and the fish and wildlife agencies suggested a mitigation plan to resolve the potential impact. The applicant's lawyer presented evidence to contest the Corps' interpretation of logging slash as "fill." Their argument included the following noteworthy points:

"The Corps does have the authority to issue Section 404 permits for the discharge of dredged or fill material. The regulations, however, at 33 C.F.R.S320 et seq. (1979), define fill material as "any material used for the primary purpose of replacing an aquatic area with dry land or of changing the bottom elevation of a water body. The term does not include any pollutant discharged into the water primarily to dispose of waste, as that activity is regulated under Section 402 of the Federal Water Pollution Control Act Amendments of 1972." In addition, Section 323.2(n) of the regulations defines the term discharge of fill material to mean "The addition of fill material into waters of the United States.

"The regulations of the EPA implementing Section 404(b) of FWPCA appear at 404 C.F.R. SS 230, et seq., and define the term fill material as "any pollutant used to create fill in the traditional sense of replacing an aquatic area with dry land or of changing the bottom elevation of a water body for any purpose. 'Fill material' does not include: material resulting from normal farming, silviculture, and ranching activities, such as plowing, cultivating, seeding, and harvesting, for the production of food, fiber, and forest products;..." These regulations define the discharge of fill material to mean "the addition of fill material into navigable waters for the purpose of creating fastlands, elevations of land beneath navigable waters, or for impoundments of water."

"We conclude that both EPA and the Corps agree that some intent to create fastlands must exist before a fill permit is necessary under Section 404. Therefore, it appears that if the activity conducted by Modoc is subject to regulation, such regulation should more properly be through the EPA than through the Corps."

The District Corps revoked their cease and desist order, noting the disagreement between the Corps and EPA in Washington over this issue. /124b/

The definition of "fill," is still unresolved; it has caused particular confusion over regulation of landfills in the bay area, that is, whether they are to be defined as "fill" or "waste." For example, the San Francisco Corps has not taken authority under Section 404 over the expansion of the Nube Island landfill in a wetland area in the south bay. EPA and the Regional Water Quality Control Board are left to regulate the landfill under Section 402 of the Clean Water Act. /152/ This section (NPDES) does not regulate wetlands, primarily focusing instead on discharge to meet water quality standards.

The San Francisco District exercises 404/10 behind dikes in the San Francisco bay area. In the absence of wetland indicator species in a diked area, the San Francisco District can apply Section 10 only and must determine the former navigability of the area. This is a difficult determination; regulatory personnel rely on early survey records and the presence of historic sloughs on the site. In the absence of on-site evidence, 1857 topographic maps of the bay margin are consulted. If they clearly show the left and right banks of a slough having occurred on a diked site, then jurisdiction is claimed.

The original size of the slough and, thus, its navigability, is an important criterion. If the maps show only a single, squiggly line, then jurisdiction is not taken. /167/ In addition, diked lands which were filled to mean high water several decades ago and which have now subsided below this level are not claimed by the Corps. Large areas of the south

bay subsided over several decades as a result of groundwater drawdown. Diked former tidelands, partially filled, present a jurisdictional dilemma. The determination of jurisdiction based on traditional navigability under these anomalous conditions leads to an often unpredictable application of authority. Industries complain of the uncertainties they experience in the permit process. /151/ In the absence of a definitive "band" of jurisdiction or recognizable vegetative indicator, landowners are unable to predict the extent of regulatory action over their lands.

## THE ROLE OF OTHER REGULATORY AGENCIES

Certain activities which can affect wetlands in this district are not under the authority of the Corps to regulate. Timber harvesting and associated road building and agricultural activities are exempt from the 404 regulations. An estimated 10,000 haul roads per year are constructed over streams within this district. /167/ These activities do affect wetlands and riparian zones along the north coast and are regulated primarily by the California Board of Forestry, and secondarily by the Regional Water Quality Control Board. The Board of Forestry does not have a specific wetlands protection policy but is subject to the guidance of the state wetlands policy.

Recent revisions to the state timber harvest rules are still under review and would include more stringent protection of riparian stream zones. Erosion control measures are also being upgraded, as are standards for road and landing construction and siting. These changes reflect some positive influences of the 208 planning process being incorporated into timber harvest regulation. /161/

The Coastal Commission has jurisdiction over those wetlands and riparian areas which are in the coastal zone and can comment on timber harvesting activities within the Commission's jurisdiction. The Regional Water Quality Control Boards do have limited regulatory power over non-point source pollutants such as sedimentation. However, the Board must determine the source and issue a stop order. In most watersheds the point of deposition and source of material are often divergent and little monitoring of sources is actually accomplished.

Agricultural activities are largely unregulated; the significance of these actions on wetlands is not well known. However, reclamation of wetlands in the Klamath Basin does still occur and only the 404 process affects this activity. /165/ The construction of dikes around wetland areas for the purpose of agricultural reclamation of the enclosed acreage is regulated under 404 providing the wetland is within the Corps' jurisdictional area (not an isolated wetland). The filling of wetlands on lands which are already in agricultural use is exempt from regulation. The excavation of materials from wetlands and riverbeds is not covered under Corps regulations. For example, gravel mining along the Russian River is under Corps authority only to the extent to which operations stockpile materials and place structures along or in the floodplain or river channel. Excavation of riverbed gravel, however, can change velocities and movements of the river water and effect bank stability and riparian resources. /159/ Local authorities, the RWQCB and the CDFG, through their streambed alteration agreements have very limited authority over these activities.

Under 208 funding, the Association of Bay Area Governments (ABAG) began a program of identification of non-point pollution problems and control technologies for bay area local governments. They developed model erosion control ordinances, introduced them to local governments, and held training sessions for public works engineers and building inspectors. The program is voluntary, with ABAG providing advice to local governments.

The jurisdictional boundaries of the Corps program and BCDC overlap to some extent in the bay. In many instances permits from both must be obtained by applicants. The Corps will not issue a permit without a prior issuance by BCDC or any other local or state jurisdiction. In turn, BCDC will not act until local agencies and other state agencies have acted. Procedural conflicts between the two agencies may occur, but the policies of BCDC regarding wetlands closely resemble those of the Corps. BCDC enters into negotiations for most Corps permits within their bay and shoreline jurisdictions. Table 17 summarizes permit actions within BCDC jurisdiction over the past twelve years.

The Corps has a substantially greater geographic area under permit authority than BCDC. Most of the 52,000 acres of diked former tidelands around the bay are potentially subject to Section 10 and/or Section 404 jurisdiction. BCDC directed public attention to protecting the bay; but the Corps has been a more powerful instrument in slowing the fill and development of diked former tidelands for the past decade.

BCDC also comments on the consistency of Corps and other federal public works projects with the Coastal Zone Management Program which BCDC is designated to administer in the bay. The program reflects the policies of the Bay Plan, and is certified by the Office of Coastal Zone Management.

TABLE 17

SUMMARY OF MAJOR BCDC PERMIT ACTIONS, 1969-1981

| Year | Major Permits Processed | Granted | Denied | Withdrawn | Pending | Amount Filled Granted | Wetland & Tidelands Restoration/ Dedication | $ of Development |
|---|---|---|---|---|---|---|---|---|
| 1969 | 30 | 25 | 5 | - | - | 35 | - | Not listed |
| 1970 | 13 | 12 | 1 | - | - | 67.8 | 200 | Not listed |
| 1971 | 35 | 26 | 4 | 5 | - | 25.11 | - | Not listed |
| 1972 | 15 | 12 | 3 | - | - | 7 | 365 | Not listed |
| 1973 | 20 | 17 | 1 | 2 | - | 4.36 | 3.6 | Not listed |
| 1974 ) 1975 ) | 27 | 20 | 0 | 4 | - | 83 | 357 | Not listed |
| 1976 | 22 | 14 | 0 | 0 | ? | 2.19 | - | $ 42,684,475 |
| 1977 | 32 | 20 | 0 | 2 | 2 | 31.4 | 30.3 | 100,500,000 |
| 1978 | 38 | 23 | 1 | 0 | 14 | 7.84 | 5.9 | 152,500.000 |
| 1979 | 55 | 34 | 0 | 7 | 14 | 17.8 | 21.2 | 93,000,000 |
| 1980 | 37 | 19 | 1 | 2 | 15 | 25.39 | 55.38 | 470,000,000 |
| 1981 | 23 | 8 | - | - | - | 5.1 | 49.6 | 130,000,000 |

Source: BCDC Annual Reports 1969-1981

Along the coast, the Corps' jurisdiction overlaps with the California Coastal Commission to some extent. Table 18 lists Commission permit actions in coastal wetlands. The Commission has permitted one project in the past three years in wetlands on the coast. /9/ This project was Woodley Island in Humboldt Bay, which the Corps also permitted after requiring substantial revision and mitigation.

*Woodley Island Marina*

The Corps issued a public notice for the Woodley Island marina project in Humboldt Bay in March 1976. The marina would have necessitated dredging 550,000 cubic yards of fill for landward facilities, and destroying eight acres of salt marsh. Although the Regional Coastal Commission approved the project, the Sierra Club appealed the decision to the State Commission, which upheld the appeal. The project was revised by a committee organized by the applicant (the Humboldt Bay Harbor and Recreation District) and was made up of representatives of the Audubon Society, Friends of the Earth, the fishing industry, Harbor Bay Pilots, recreational boaters, League of Woman Voters, mariculture industry, and the Sierra Club.

The specifications of the project before and after redesign demonstrated the extent of revisions that were negotiated:

| Dredging | Initial Design | Revised Design |
|---|---|---|
| Volume dredged | 550,000 cubic yards | 350,000 cubic yards |
| Length of dredged area | 3,000 linear feet | 2,000 linear feet |
| Impact on land area | 5 acres | 4 acres |
| Impact on intertidal area | 7.97 acres | 5.5 acres |
| Impact on subtidal areas | 11.36 acres | 7.0 acres |
| Disposal | | |
| Disposal site A | 220,000 cubic yards | 70,000 cubic yards |
| Dosposal site B | 350,000 cubic yards | 280,000 cubic yards |

TABLE 18

CALIFORNIA COASTAL COMMISSION ACTIONS IN WETLAND AREAS

1977 to 1981

| Region | Year | Wetland Name | Acreage Preserved or Saved | Type of Action |
|---|---|---|---|---|
| CENTRAL COAST | 1978 | Moro Cojo Slough | 15 | Permit conditioned to dedicate easement over portion of slough |
| | 1979 | Elkhorn Slough | 1,510 | Elkhorn Slough Estuarine Sanctuary designated |
| | 1978 | Moss Landing | 1 | Permit required for deposit of dredge material in longshore current rather than on wetland |
| | 1977 | Locoran Lagoon | 15 | New channel opening constructed by Department of Public Works |
| | 1977 | Valencia Lagoon | 4.3 | California Department of Fish and Game constructed berm to restore natural pond |
| | 1977 | Watsonville Slough | 10 | Permit issued to State Parks conditioned to prevent disturbance to wetland |
| | 1977 | Watsonville Slough | .25 | Renovate gate with condition to establish monitoring program |
| | 1978 | Vernal Pond | 7.7 | Land division conditioned to dedicate natural preserve for vernal pond |
| | 1977 | Moran Lagoon | 8 | Restoration by county Parks and Recreation |
| | 1979 | Woods Lagoon | 2.3 | Land division refuge conditioned to dedicate easement for restoration |
| NORTH CENTRAL COAST | 1978 | Jenner | 3 | Permit required for open space easement over wetland as a condition for subdivision |

TABLE 18 (continued)

| Region | Year | Wetland Name | Acreage Preserved or Saved | Type of Action |
|---|---|---|---|---|
| NORTH COAST | 1979 | Lake Earl | 2,000 | State Parks and Recreation and CDFG acquired 7,000 acres of which 2,000 were wetland |
| | 1979 | Sandmine Wetland | 340 | Purchased by CDFG |
| | 1977 | Big Lagoon | 300 | State Lands settlement |
| | 1980 | Inglenook Fen | 50 | Parks and Recreation acquired |
| | 1980 | Hunter's Lagoon | 100 | 450 acres total purchase of which 100 are wetland |
| | 1979 | Arcata Marsh | 63 | Restoration project by Coastal Conservancy |
| | | Elk Creek | 500 | Regulatory study required by Regional Commission |
| | | Maurhoffer Creek | 120 | Regulatory study required by Regional Commission |
| | 1978 | Elk Creek | 100 | Permit for land division denied |
| | 1978 | Elk Creek | 24 | Permit for land division denied |
| | 1976 | Arcata | 20 | Permit to construct industrial park denied |
| | 1977 | Eureka | 30 | Permit for land division denied |
| | | Humboldt Bay | 40 | Permit to construct tidegate denied |
| | | Woodley Island | 16 | Regional Commission allowed four acres of wetland to be filled with 20 acres restored |

Source: William Travis 1980. Evaluation of California's Coastal Zone Management Program. Letter to Rosella Sussman, Office of Coastal Zone Management.

| Riprap | Initial Design | Revised Design |
|---|---|---|
| Length | 3,000 linear feet | 2,000 linear feet |
| **Marina** | | |
| Number of boat slips | 214 | 237 |
| Boat slip size | 46 linear feet | 49 linear feet |
| Number of main piers | 8 | 9 |
| Linear extent of piers | 2,400 linear feet | 2,700 linear feet |

Mitigation and compensation for the project included five acres of salt marsh, a freshwater pond area, and dedication of an unspecified off-site area for restoration to tidal action. /124a/

The marina project was controversial and required various conditions being imposed by the two separate permit authorities. The State Coastal Commission specified both redesign of the project and reduction of the impacted area. The USFWS, through the Corps permit process, required off-site compensation for wetland habitat lost and assurance that the adjacent freshwater habitat would be maintained. Although the two permit processes overlap in many situations, in this instance the variety of agencies responding to both authorities were able to revise the project to the satisfaction of all concerned. Also, interesting to note is the constructive role which the Sierra Club and the public groups served in the permit process.

The Coastal Commission issued their permit for the revised project in January 1977, and the Corps issued their permit shortly thereafter. /124a/

## SACRAMENTO DISTRICT

The Sacramento Corps District has jurisdiction in California over the entire Central Valley and all the watersheds draining into it. The jurisdiction includes the eastern slope of the Sierra to a point just north of Bridgeport Reservoir: south of this the western slope is included.

### OVERVIEW OF OPERATION

The majority of permits (approximately 70%) issued by the Sacramento District are under Section 10 authority for waterside development along the Sacramento River or in the Sacramento-San Joaquin Delta. Section 404 permit applications are generally for fill for conversion to agriculture, widening of roadway and bridge crossings, or the development of residential areas, marinas, and other facilities. Agricultural activities requiring permits are those which would involve land leveling or otherwise filling wetland areas not part of an ongoing farming operation. For instance, the Corps would need to permit the diking or grading of those fallow wetland areas in their jurisdiction for conversion to cropland. The construction of drainage ditches to alter the hydrologic regime of a farmed area to allow for another type of farming use also requires a permit. For example the conversion of a field farmed a portion of the year and wetland a portion of the year to a field drained and farm year-round constitutes a different use and a permit is needed. /160/

Approximately half the applicants to the Sacramento District seek pre-application consultation. According to the District, this process results in a higher percentage of complete applications and in fewer permit denials. Pre-application consultations reduce conflicts with reviewing agencies and ultimately results in the loss of fewer acres of wetlands. /160,162b/

In fiscal years 1980 and 1981, the Sacramento District denied 6% of the applicants requesting Section 404 permits. Of the authorized permits,

approximately one-fourth were issued to fill wetlands. According to the District, "The amount of wetlands created or destroyed would be approximately equal, because whenever possible, the District has tried to require compensation for wetland values lost before issuing a 404 permit." /162b/

The project sites of 404 permitted projects are later field-checked by Corps personnel to determine if the applicant is complying with the conditions of the permit. Permit sites are also monitored with aerial photo surveillance. Reconnaissance flights are made monthly in areas where development pressure is high and staffing inadequate to carry out the monitoring.

Since 1980, 415 violations involving the discharge of fill material have been detected in the entire Sacramento District (including parts of Nevada, Utah, and Colorado). After-the-fact permits were granted in approximately one-fourth of these cases. Two of the cases were prosecuted, one resulting in a court-ordered restoration. Private parties reported a small percentage (5%) of the violations.

Although the Section 404/10 program of the Sacramento District does not take jurisdiction over large portions of the wetland habitat in the Central Valley, the limited areas of "adjacent wetlands" under their regulation have largely benefited from the program. The District is generally sensitive to the comments and requests of the resources agencies. Based on agency concerns, the District may deny permits or attach special conditions which require substantially more than acre-for-acre compensation for the loss of wetlands habitat. However, negotiating conditions acceptable to the applicant, reviewing agencies, and the Corps, often takes several months and is probably the major factor causing delays in the issuance of 404/10 permits. Disagreements among the wildlife agencies and the Corps are rarely serious enough for the case to be elevated to a higher level for decision making. /160/

In some cases, public notices for projects issued by the Sacramento District have contained errors or misinformation. Public notice errors concerning the extent of on-site wetlands acreage and the number of trees that would be lost to the project, and misinformation on whether the proposed project would affect threatened or endangered species or their critical habitat, have been reported by various federal, local, and private agencies. /130,131,132/

The District has described the purpose of the regulatory functions program as: "To protect the public interest by helping to maintain the capacity of the nation's navigable waters and by regulating the discharge of dredged or fill material into waters of the United States to help maintain the physical, chemical, and biological integrity of these waters."

SIGNIFICANT BENEFITS AND INADEQUACIES

The major inadequacy of the 404/10 program as it applies to the Central Valley region of California is an inherent limitation of the jurisdiction: the program does not regulate the managed wetlands of the valley, which constitute the great majority of wetland acreage in the District. The Corps has no jurisdiction over these areas, unless they are directly adjacent to waterways or natural marshes. Since managed wetlands are irrigated, they would not be wet "under normal circumstances" and not support wetlands vegetation; therefore, they cannot be regulated under the 404 program. In addition, the Sacramento District, unlike the San Francisco District, never exercises Section 10 and rarely Section 404 authority behind dikes. In the Delta areas, the levees were constructed under a variety of state and federal laws to protect agricultural lands from inundation. These lands have become dry fast lands and have remained as such for the past 75 years or more. Under the Federal Swamp Act of 1850 and the implementing State Statutes, the Delta lands behind the levees were wholly reclaimed. Historically, they were never considered to be navigable waters of the U.S. for purposes of Section 10 nor can they be subject to Section 404 since they existed as dry land prior to 1972.

However the Corps does exert jurisdiction under Section 404 in those areas behind the levees that are presently considered to be adjacent wetlands.

Furthermore the Corps believes that the bulk of the Delta lands were, prior to the reclamation, above the mean high water mark. The present condition of the land, being below mean high water, having been caused by subsidence, wind erosion and oxidation. /87b/

Several other types of wetlands in the Sacramento District are regulated under a nationwide permit; these include vernal pools, pocket marshes, closed basins (such as the Tule and Kern Rivers) and stream-courses below 5 cfs average annual flow.

In one case detailed below, the Corps changed the status of an individual permit to nationwide, and although the U.S. Fish and Wildlife Service did not agree with the change, the case was not elevated.

*Anderson Marsh*

Anderson Marsh is a 510-acre freshwater marsh in the southwestern end of Clear Lake in Lake County. Although the lake is periodically reclaimed for agricultural purposes during periods of low water, much of it supports dense stands of marsh vegetation when the area is inundated. The marsh supports more than 100 species of birds, including waterfowl, shorebirds, wading birds, birds of prey, and songbirds. Around 60 species of birds nest in the area.

In September 1977, an applicant proposed to upgrade and repair an existing levee to reclaim approximately 400 acres of the marsh for cultivation. The Environmental Protection Agency, U. S. Fish and Wildlife Service, and The Resources Agency of California objected to the issuance of the permit. All of these agencies were concerned about the effect of the project on fish and wildlife resources. The Sacramento District subsequently denied the permit application in March 1978, based on the information provided by the reviewing agencies. /3/

*Oakley-Bethel Island Wastewater Reclamation Facility*

In October 1981, the Oakley-Bethel Island Wastewater Management Authority applied for a permit to construct a wastewater reclamation facility which would result in the loss of around four acres of wetland adjacent to Big Break along the San Joaquin River. Both the U. S. Fish and Wildlife Service and Department of Fish and Game indicated that under normal circumstances they would not recommend that the permit be issued. However, because relocation would have greatly increased the cost of the project, and a delay in construction jeopardized federal funding, the U. S. Fish and Wildlife Service agreed not to object to the issuance of the permit provided that the applicant fully compensate for the loss of wetland values by meeting the following conditions:

1. The applicant create 15 acres of new wetland adjacent to Big Break by October 1982;

2. The wetland creation project meet the approval of California Department of Fish and Game.

3. The applicant maintain the created wetland in a productive state in perpetuity.

However, the Wastewater Management Authority stated that they would be unable to meet the third condition because they did not have the resources nor legal authority to maintain the created wetland in perpetuity. Additional time was given to the applicant to negotiate acceptable conditions with the concerned agencies. Finally, in March 1982, the agencies and the Wastewater Management Authority negotiated the following conditions:

1. That the applicant create 10-15 acres of wetland and develop a plan for its management which is acceptable to the California Department of Fish and Game, National Marine Fisheries Service, and the U. S. Fish and Wildlife Service. The wetland shall be created and managed according to the plan.

2. That creation of the new wetland shall be completed within one year from issuance of the Notice to Proceed with construction of the wastewater treatment facilities. /130/

Numerous other permits issued by the Sacramento District have included special conditions formulated by state and federal agencies. At the request of the Environmental Protection Agency and the Department of Fish and Game, the Corps required an applicant to create and dedicate a five-acre wildlife area to compensate for the loss of one acre of wetland along Mud Slough. The Sacramento County Department of Public Works proposed to fill overflow channels adjacent to the Consumnes River and were required to recreate channel elsewhere and replant three trees for every one displaced to satisfy the U. S. Fish and Wildlife Service and the Department of Fish and Game.

*Discovery Park*

In at least one recent case, the Sacramento District has changed the status of a permit from individual to nationwide over the objections of the commenting agencies. In May 1980, the Sacramento County Department of Parks and Recreation applied for a permit to fill a wetland adjacent to the American River at Discovery Park to relocate an existing bicycle trail. Both the U. S. Fish and Wildlife Service and Department of Fish and Game initially objected to the project, which the Service stated would fill approximately 12,000 square feet of seasonally flooded wetland. But later the agencies agreed to withdraw their objections to the permit, if one of the conditions stipulated that a new wetland area of one-half acre would be created. However, the Corps subsequently changed the status of the permit based on the following statement to the Sacramento County Department of Parks and Recreation (August 28, 1980):

"A recent field inspection showed that the wetland area affected by the proposed project is considerably less than previously estimated. It appears that the proposed project will involve placement of less than

200 cubic yards of fill in the wetland area; therefore, the proposed project can be constructed under a nationwide general permit for minor road crossings."

The U. S. Fish and Wildlife Service responded to the District Engineer:

"The Service objects to the inclusion of this project under the nationwide permit because it does not meet application condition (7) of 33 CFR 323.4-3(b), i.e., that the discharge will not occur in a component of a state wild and scenic river system. The Lower American River meets the latter criterion for exclusion from the nationwide permit program. Therefore, fill activities undertaken in this river and its adjacent wetlands require an individual permit. We request that the Corps withdraw the permission recently granted under the nationwide permit program."

However, since the Park District had already carried out all the conditons of the individual permit before the Corps changed its status to nationwide, the U. S. Fish and Wildlife Service took no further action on the case. /32/

Some permits are issued after illegal fill has already taken place. In February 1980. the U. S. Fish and Wildlife Service notified the District Engineer of illegal filling in Stone Lake, Sacramento County. An application to retain the approximately 6,000 cubic yards of fill material was subsequently filed by the responsible party. As part of the application, a somewhat larger wetland than that which had been filled would be created. The U. S. Fish and Wildlife Service did not object to the permit issuance, but the Department of Fish and Game initially requested that the permit be denied and the applicant be required to remove the fill and restore the area to its pre-projection condition. The Department later revised its stance after it became apparent that

fill removal would result in even greater damage to the surrounding area. They suggested six conditions to the permit - which were decreased to four and the permit issued. /160/

THE ROLE OF OTHER REGULATORY AGENCIES

There is little regulatory overlap between the Sacramento District and other regulatory agencies in California. Essentially, the jurisdiction of only one other agency, the California-Tahoe Regional Planning Agency (CTRPA), overlaps with the 404/10 jurisdiction of the Corps. CTRPA regulates all development in the Lake Tahoe Basin. The Sacramento District coordinates with CTRPA when issuing permits in the Lake Tahoe Basin. CTRPA currently is negotiating with the Sacramento District for a general permit which would regulate many of the activities regulated by both agencies. /160/

Although there are no other agencies which regulate the development of wetlands within the Sacramento District of the Corps in California, three other government programs provide incentives for landowners to maintain their property as wetlands.

The Water Bank Program is administered by the Soil Conservation Service with assistance from the Agricultural Stabilization and Conservation Service (ASCS) and several other state and federal agencies. The major objectives of the program, initiated in 1970 by the Water Bank Act (Public Law 91-559), are to preserve, restore, and improve habitat in important migratory waterfowl nesting and breeding areas and to benefit other wildlife resources. Under the Water Bank Program, landowners with eligible wetlands may enter into ten-year agreements. They then receive annual payments for conserving the land as wetlands and protecting it from practices which would affect its wetland character and value to nesting waterfowl. Water Bank agreements can be renewed for additional ten-year periods upon the consent of all parties.

The Water Bank Program was originally launched to protect the pothole wetlands of the Dakotas and Minnesota, an important breeding area for waterfowl in the U. S. The management requirements of the program, therefore, were designed to protect and maintain waterfowl nesting habitat. However, in most areas of the Central Valley, there are few nesting waterfowl. It has been recently proposed to modify the management guidelines for Water Bank lands in California so that landowners can more effectively manage for waterfowl wintering habitat. These modifications currently are pending likely approval by the State Management Technical Committee. /197/

As of December 31, 1981, a total of 32,121 acres in California were part of the Water Bank Program. Almost all of this acreage is contained in Central Valley counties; Merced County has the highest total with 16,043 acres in Water Bank. The other participating counties are Siskiyou, Modoc, Lassen, Plumas, Butte, Sierra, Colusa, Sutter, and Yolo. Approximately one-quarter of the Water Bank acreage is flooded and vegetated with emergent plant species; the remainder is maintained as adjacent upland habitat. /197/

Another federal program initiated to conserve and protect wetlands is the Conservation Easement Program of the U. S. Fish and Wildlife Service. The program was conceived in 1977 and is funded with duck stamp funds authorized by the Migratory Bird Conservation Act. Under the program, a landowner is paid a fee to sign his land into easement. To comply with easement stipulations, the landowner cannot alter the land in any way that is detrimental to waterfowl use. Three project areas: West Grasslands, Butte Sink, and Colusa Basin were established at the onset of the easement program. The three project areas, which included a total of 78,800 acres, were seasonally flooded lands for which the U. S. Fish and Wildlife Service hoped to obtain easements. Otherwise,

they were afforded no special status. Since 1977, easements have been acquired on a total of only 12,360 acres (11,660 acres in West Grasslands and 700 acres in Butte Sink), and almost 20% (14,640 acres) of the acreage included in the original project areas has been lost. Projections estimate that a minimum of 27,000 acres in the three project areas will be converted to agriculture within the next six years. /138/ In addition, current funding could provide for a maximum of 38,400 acres put under easements in the next six years.

The third program which encourages private maintenance of wetland habitat is the Grasslands Water District which distributes water to landowners in the San Joaquin Valley. The Grasslands Water District (originally the Grasslands Water Association) began receiving 50,000 acre-feet of federal water per year in the late 1940s as part of a water rights settlement. In 1956 the Grasslands Bill authorized the use of federal water for recreational purposes and the Grasslands Water Association became a water district in order to distribute water to local duck clubs. Landowners, under the Cooperative Habitat Program of the district, receive cut-rate water ($1.00 to $3.00 per acre-foot) on the provision that the water cannot be used for agriculture. Presently the district serves 52,000 acres of seasonally flooded wetland in the San Joaquin Valley, including private landowners, the Kesterson National Wildlife Reserve, and the Los Baños and Mendota WMAs. Although landowners can petition to join the district, new members are not being accepted as the district is currently at capacity. /183/

A landowner in the San Joaquin Valley could conceivably participate in all three of the above programs. Many members of the Grasslands Water District have signed up under Water Bank or have sold a conservation easement to the U. S. Fish and Wildlife Service, and landowners with easements can also be under Water Bank.

The United States Bureau of Reclamation has no wetlands enhancement program per se; however, wetlands often are enhanced or created as part of federal water projects. /179/ Similarly, the California Department of Water Resources (DWR) will create wetland areas as compensation for state water projects. For example, a wetland area was created to mitigate part of the Oroville Dam project. /195/ DWR also is presently in the process of acquiring tracts of riparian vegetation along the Sacramento River for flood control purposes.

## LOS ANGELES DISTRICT

The Los Angeles (L.A.) Corps District has authority over the California coast from Pt. Conception south to the Mexican border and the watersheds which drain westward in the coastal range. The boundaries also encompass the California Desert area and the Colorado River, extending into the adjoining states of Arizona and Nevada.

With the amendments to the FWPCA (Clean Water Act), the regulatory section of the L.A. District became part of the navigation branch, and a separate environmental branch formed. A recent reorganization has created a regulatory branch, distinct from navigation with its own environmental review department.

### OVERVIEW OF OPERATION

The majority of this district's permit applications in California are in the coastal area and watersheds; a few are in the desert region. Many applications involve flood control and bank stabilization projects along rivers and urban development in floodplains and riparian and wet- and areas. Maintenance dredging and port expansions are also common on permit actions. After-the-fact permit applications for illegal fills are also common. /174,209,194/ Permits are rarely denied; conditions of approval/mitigations are added to permits upon issuance if the reviewing agencies request such conditions and the Corps deem them appropriate. /194,209/ Few permit decisions are elevated to higher levels. The District makes an effort to work out agency objections to permits at the District level. /174/

Overall, a review of the L.A. Districts' regulatory program reveals largely negative observations and evidence. Criticism from commenting agencies and conservation groups overshadows any benefits to wetlands that may accrue from the program. The main problems may be categorized as operational, that is arising from the District's operation of the program, and substantive, that is pertaining to the actual application of regulations to the wetland and riparian resources of the district.

In regard to the operation of the program, the L.A. District has been criticized by various reviewers principally for side-stepping its role as a regulator and decision maker. /152,194,164,199,154,186,185,184, 209/ For example, the Corps has referred permit actions involving fill in wetlands to outside negotiations between the applicant and wildlife agencies or private groups responding to public notices. /152,164,199,181, 194,154/ One applicant, the Port of San Diego, completed many pre-application sessions with the wildlife agencies for projects in the Port district in order to work out reasonable mitigation schemes. The applicant expressed frustration at the Corps' past uncooperative attitude toward pre-application consultations. /166/ The District has also been criticized for avoiding controversial issues and decisions which involve considerable debate. /194, 164,199,154,186,184,209/

Another major complaint voiced by reviewing agencies has been the inadequacy of information in public notices and poor communication between the Corps and the reviewing agencies. /152,194,164,199,181/ One recent public notice issued for the Port of Los Angeles project involving a 619-acre fill, installation of two wharves, construction of a causeway and a 1,500,000 cubic yard rock dike was only 7.5 pages with 2 paragraphs describing the project, no preliminary environmental assessment, and four pages of diagrams. /126/ Lack of information in the public notice has been cited as a major obstacle to commentors who then must request further details, prolonging the review process. /152,194,164/ To alleviate this problem the Corps and agencies have recently (June 1982) begun bi-monthly meetings to facilitate communication and issue solving.

In the view of many agencies there is a major discrepancy between the District's demonstrated 404/10 regulatory activities and the program's intent. In 1981 the USFWS conducted a review of the district and documented the District's lack of action on forty illegal fill cases. The USFWS listed several issues they felt the Los Angeles District Program failed to address. These included: continual degradation and loss of

fish and wildlife habitat within Corps jurisdiction; lack of consultation with the USFWS over unauthorized activities and after-the-fact permits; Corps avoidance of exerting jurisdiction over wetland and riparian areas if any controversy could result; inconsistent application of the regulations in similar cases; inappropriate use of the nationwide permit, and lack of an effective and efficient enforcement program (not following regulations, excessive periods of time before action is taken, inaction, and failure to issue cease and desist orders.)

The USFWS considered this laxity of enforcement to encourage present violators and not discourage others from similar violations. The USFWS felt they expended abnormally large amounts of manpower and funding in carrying out their responsibilities and investigating illegal activities due to the Corps' laxity of enforcement. Both the National Marine Fisheries Service and the EPA generally agreed with the USFWS evaluation of the Los Angeles District program. Both these agencies had unanswered requests for information from the Corps and felt frustration in their interactions with the District.

The District responded to the USFWS in a letter and offered to discuss the issues of controversy. In addition the regulatory program was moved out of the navigation branch to a separate department. However much of the frustration between the two agencies has not been resolved. /194/

Enforcement is still a major problem in the L.A. District. Both limited funding and staff have reduced surveillance and inspection capabilities. /174/ The district is considering beginning a more comprehensive surveillance and enforcement system in order to identify illegal fills. /174/ However, the limited power of the program to fine and force violators to mitigate their actions is a major stumbling block. /209/ In addition, many violators (both public agencies and private parties) do not respond to cease and desist orders or cooperate with mitigation negotiations for after-the-fact permits. /209,212.194/ One case, excerpted from the USFWS document points out the combined difficulty of gaining applicant cooperation and satisfactory actions from the district.

*First Street Area*

On June 22, 1972, the FWS reported to the district several unauthorized fills in the Tijuana Estuary along First Street in the City of Imperial Beach. In August 1972, the district replied that they would take no action on the matter because they believed that the material was not placed below the plane of mean high water. Additional fills were reported in the same area of the estuary in October of 1972. The subsequent report covered two activities, both ongoing, which filled over two acres of wetlands and closed off a large tidal channel, apparently both without Section 10 permits.

In April, 1973, the district issued a public notice for approval of an existing fill at Imperial Beach (Tijuana Estuary) at the corner of Coronado Avenue and First Street. The NMFS replied to this public notice on May 3, 1973:

> "The fill site involved in this permit requested is on the border of a large marsh area which is subject to tidal action. While the size of the fill involved in this permit requested is minor, the broader implication of an after-the-fact authorization of such work is of great importance. If this permit is issued it could establish a dangerous precedent. An area inspection indicated two similar fill projects are being undertaken due south of the subject work. In the absence of permit applications for either of those projects, it would appear they too are being performed without a Corps permit. Allowing a precedent to be set which could endanger a valuable resource is unacceptable. We must, therefore, object to the issuance of the requested permit and ask the Corps to take the steps necessary to alleviate the problem. We would appreciate being informed of the Corps' final decision on this matter."

The next month another public notice was issued for approval of 10,000 cubic yards of existing fill material in the Tijuana Estuary in the area of the fill reported by the FWS in June 1972. The NMFS in July 1973 asked that this permit be denied.

In July 1973, the district issued a third public notice for approval of an existing fill, the fill reported by USFWS in October 1972. Again the NMFS requested denial of the permit. This problem has yet to be resolved. /136/

*Santa Ana River*

A slightly different case also involved 404 permit enforcement and the Endangered Species Act. In September 1978, the Orange County Environmental Management Agency applied for a permit to widen the Santa Ana River mouth by dredging and recontouring the channel and lining it with concrete. This area was used by the endangered California least tern as a feeding area, and the project would have eliminated habitat of this species. Negotiations between the applicant and wildlife agencies produced a mitigation plan which would create and maintain an alternative feeding habitat near the project. The plan called for the recontouring of a degraded wetland and installation of culverts to maintain sufficient water levels to create a viable habitat.

The permit was issued with special conditions for creation of this wetland habitat prior to construction in order to minimize impacts on the least tern. A seperate permit was required to remove the culverts. After the project construction in June 1979, the applicant applied for a permit to remove the culverts; prior to the issuance of a public notice (October 9, 1979) the applicant removed the culverts (October 5, 1979) thus drying the wetland habitat of the endangered species. The Corps responded to the Orange County Environmental Management Agency:

> Since a mutually agreeable resolution of this situation was not reached at either the 18 or 24 October meeting with your representatives, I hereby demand, pursuant to 33 CFR, Section 325.9(b) of our regulations, that you immediately restore the tidal flow into the alternate feeding habitat. Failure to immediately effect the restoration of tidal flow will result in my recommendation to the United States Attorney on 7 November 1979, that legal action be instituted against EMS on Friday, 9 November 1979."

The U.S. Attorney filed a suit and settlement was made out of court for a $10,000 compensation from the Environmental Management Agency. /125/

In this instance the Corps negotiated an adequate mitigation plan and used the permit process to assure continuance of the restored wetlands throughout the project. The applicant failed to comply with the permit stipulations and the Corps took appropriate action.

The problem of illegal fills seems to stem from several factors: 1) an unwillingness on the part of violators and sometimes applicants to cooperate with permit conditions or the regulations themselves; 2) lack of enforcement personnel and an efficient surveillance system in the Corps district; and 3) absence of an administrative law process to permit prosecution of lesser violations. Several agency commentors have pointed out the difficulty of instituting legal proceedings under the U.S. Attorney's Office for 404 violations. The overloaded court system and low priority of 404 violations as compared to felony crimes were cited as reasons for lack of legal proceedings against violators. /152,194,181,209,212/

SIGNIFICANT BENEFITS AND INADEQUACIES

A number of inadequacies exist in the 404/10 program as it applies specifically to the Southern California region. These relate largely to the inherent limitations of jurisdiction under the regulations and their consequent inadequacy to protect the resources.

The nationwide permit which regulates stream courses below a 5 cfs average annual flow or median flow has broad geographic application in the arid Southern California climate. In order to determine jurisdictional boundaries, the Corps commissioned a survey to determine the limits of these flows based upon stream gauges and precipitation records. The Corps has limited their jurisdiction to the first upstream point on the watercourse at which a 5 cfs average annual flow criterion is met, excluding drainage areas above that point. /174,152/ This limitation of jurisdiction

excludes nearly the entire desert region (excepting the Colorado River) and much of the coastal watersheds from individual 404 permit regulation. Much of the remaining riparian habitat along the urbanized coast is in these watersheds.

*Arroyo Simi Creek*

The problem of determining this jurisdictional line is best exemplified by a specific permit action on Arroyo Simi in Ventura County. The project involved the placement of 600,000 cubic yards of fill and 15,000 cubic yards of riprap along Arroyo Simi Creek in order to construct an industrial park. The project would have filled 24 acres of wetland and isolated 13 acres from hydraulic connection. The site has mixed stands of riparian vegetation and emergent marsh vegetation. Over 100 species of birds inhabited the site, and students from the nearby college had been studying the area for a number of years.

The Corps determined, by consulting hydrologic records, that the project site was below headwaters and an individual permit was needed. They released a short public notice in February 1982. Their environmental assessment was completed after the public review period and recognized the site as a prime natural groundwater recharge area having a high wildlife habitat value.

On March 15, the applicant completed their own study of stream flows, based upon stream gauge data collected by Ventura County for three points along the stream. Their consultants concluded the site had less than 5 cfs average annual flow per year. They also concluded the water flow percolated into the streambed near the site.

The applicant responded to the Corps:

> "(The applicant) has lost approximately forty-five (45) days and tens of thousands of dollars because of the delay of our project. (The applicant) has been subjected to unwarrented allegations that we are needlessly destroying riparian habitat when in fact, we are dedicating in perpetuity 24.3 acres of our project (30% of the total project area) to wildlife habitat.

> The Army Corps of Engineers, through several mistakes on their part, have allowed a handful of radical environmentalists to delay a project which the Corps does not even have jurisdiction over. It has allowed these radicals, most of whom don't even live in the area, to delay the project over the wishes of the people who live and work in the Moorpark community. It has allowed these radicals to delay a project that is not only in the best interest of the public, but also in the best interest of wildlife.
>
> (The applicant) is formally requesting that the Army Corps of Engineers withdraw their request for an individual permit on this project."

The Corps subsequently (March 19) withdrew their requirement for an individual permit and granted a nationwide permit. The applicant was thereafter subject only to recommended general management practices included under these permits. Eight response letters had been received on the public notice protesting the project's destruction of riparian habitat.

The case points up a problem that is distinctive in regions with a Mediterranean climate, that is, with dry summers and wet winters. One commentor pointed out: median streamflow values do not present an accurate picture of water-habitat availability. In a Mediterranean climate the wet season, at most, is 4-5 months of the year. If the mediam annual flow in cfs is used to determine the headwater location, then practically all streams in Southern California will fall outside the jurisdiction of the Army Corps of Engineers.

Average <u>monthly</u> flows in cfs for the 80-81 water year arranged in increasing order illustrate the principle:

| | | |
|---|---|---|
| | 2.53 - November | |
| | 2.78 - June | |
| | 3.37 - October | |
| | 3.65 - July | |
| | 3.71 - August | |
| | 3.76 - September | |
| Median - 3.76-4.01 | 4.01 - May | |
| | 4.14 - December | |
| | 4.28 - April | |
| $\bar{x}$ = 6.98 | 10.80 - February | High Rainfall Months |
| | 13.20 - January | |
| | 27.60 - March | |

The median will almost always lie in values which represent only the dry months of the year. By using the median one completely ignores the water which is important for plant growth, particularly in riparian habitats in Southern California. This water percolates into our sandy soils of streamside habitats to recharge the groundwater. The deep taprooted plants use this moisture all year to maintain their metabolism.

Using the mean value would classify this site as not yet above the headwaters, whereas the median value commands just the opposite decision. Other situations in which streams appear to dry up only to reappear downstream presents similar problem of definition.

The District engineer declined to invoke discretionary authority over the Arroyo Simi project. /127/ The 5 cfs rule in the preservation of riparian resources in Southern California remains an issue. The correct method for determination of flows is also unclear.

*Vernal Pools of San Diego County*

Another nationwide permit applies to isolated wetlands (lakes, ponds). The vernal pools of San Diego County qualify as isolated wetlands and are habitat for an endangered plant species, mesa mint, (*Pogogyne abramsii*) and many other species proposed for federal endangered species status. The threat of this habitat stems from the rapid development of the flat mesa lands of northern San Diego county, where vernal pools most commonly occur.

A March 1979 letter to the District Engineer from the USFWS requested that he invoke his discretionary authority over some vernal pools which were proposed for development and habitat of the endangered species. In June 1979, after consultations between the local jurisdiction, City of San Diego and the wildlife agencies, conservation groups and others, the District engineer decided to exercise his discretionary authority over the pools because of the presence of endangered species.

The vernal pools cover approximately 2,516 acres, 45% of which are in Navy ownership. The original vernal pool habitat in San Diego County had totaled 28,000 acres prior to 1850 but had decreased to less than 3,000 acres in 1978, or a 90% reduction. This action covered pools in both San Diego County boundaries and the cities of San Diego, San Marcos, Chula Vista and Carlsbad as well as the Miramar Naval Air Station.

A concerted planning effort began between the City of San Diego, the Corps, California Department of Fish and Game, USFWS, California Native Plant Society and several consultants. An advisory committee was formed which evaluated and set priorities for various areas of pools and recommended areas for preservation.

The city preservation plan identified approximately 800 acres of vernal pool habitat on land under city jurisdiction. The program recommended that approximately 270 acres of vernal pools habitat under city jurisdiction be protected by the federal permit review process. An individual Corps 404 Permit and Section 7 consultation (Endangered Species Act) with the U.S. Fish and Wildlife Service would be required prior to disturbance of vernal pools in particular areas. All other properties would be released from individual 404 review because of their nationwide permit status. The disturbance of all pools in areas under city jurisdiction would be subject to City of San Diego review under the requirements of the California Environmental Quality Act. The city in their environmental review usually requires monetary compensation at a rate of $4,000 per habitat per acre. The city intends to buy other vernal pools areas with this fund. However costs for replacement of this habitat is estimated at $40,000 per acre. The city has not yet purchased any pools as preserves despite allowing approximately 100 acres to be filled. In addition, under CEQA review, the city has the ability to judge the benefits of a project against the loss of vernal pools and decide if the benefits outweigh the losses in permitting a development. /152b/

The plan also noted that the federal review process could potentially preserve over 1,300 acres of vernal pool habitat on land under city, county, and Navy jurisdiction. Approximately 1,100 acres of vernal pool habitat occur on NAS Miramar; Section 7 consultation with the U.S. Fish and Wildlife Service could potentially preserve some of these pools. Approximately 190 acres of pools on private property under city jurisdiction would be required to obtain an individual Corps 404 permit prior to disturbance of vernal pools. The application of individual permit process to these areas has not preserved as many pools as the city had expected. /152b/ Both on and off-site mitigation has been difficult to formulate for these permits and several permits have been subject to political pressure for decreased areas of mitigation. /194,172/

*Madrona Marsh*

Another case history involving jurisdiction and limitation of the 404 program is that of Madrona Marsh. This marsh located in an urbanized area of Torrence in Los Angeles County and consists of 11 acres of seasonally flooded freshwater marsh with 43 acres of surrounding upland habitat. The marsh is used by migratory waterfowl and a total of 98 bird species. Storm run-off from the surrounding 200 acres of land fills the marsh seasonally, and the area is an isolated wetland.

The Friends of Madrona Marsh, a local conservation group, in September of 1979 requested the Corps to take jurisdiction over the marsh and require a permit for a proposed development which would fill most of the area. The Corps contacted the applicant in February 1980 informing him of their requirements for an individual permit rather than a nationwide permit covering isolated wetlands. Their reasons:

> "The US Army Corps of Engineers recognizes the existing values of Madrona Marsh for storm and flood water storage, habitat for wildlife, including migratory waterfowl, and general open space resources. The marsh also has potential educational and scientific values. The Corps' action is designed to protect these resource values."

In April 1981 the Pacific Legal Foundation and Torrence Investment Company challenged the Corps jurisdiction on the grounds that Madrona Marsh was not sufficiently connected with interstate commerce to warrant federal regulation. The Corps withdrew its jurisdiction in August 1981 and stated:

> "I, (the District Engineer,) have concluded that the mere presence and usage of the wetlands in Madrona Marsh by migratory waterfowl is not sufficient to make those wetlands part of a chain or connection to the production, movement, and/or interstate commerce. Therefore, I cannot find that the degradation or destruction of these wetlands could affect interstate commerce."

The EPA reviewed the geographic jurisdiction of the section 404 program and declined to designate Madrona Marsh a special case. EPA stated that it would accept the Corps determination of jurisdiction as binding, but nevertheless maintained the validity of the Corps original assertion of jurisdiction, EPA did not agree with the Corps' second interpretation of the effects of migratory waterfowl habitat loss.

EPA based this conclusion upon analysis of legal precedents and court recognition that wetlands used by migrating waterfowl is sufficient to warrent federal jurisdiction.

The Friends of Madrona Marsh in October 1981 petitioned the Chief of Engineers in Washington to review the jurisdiction. Their reasons:

> "The constitutional nexus to interstate commerce required for the exercise of section 404 jurisdiction and the concerns for the aquatic environment are met when the self-sustaining wetlands is utilized by migratory waterfowl."

The Los Angeles Corps then completed a reassessment of jurisdiction and released a public notice requesting new information in making their determination.

The basic issue of the relationship of Madrona Marsh to interstate commerce and Corps jurisdiction rested on several issues: migtatory waterfowl use of marsh, foreign and out-of-state visitors to the marsh and export of petroleum pumped from the site.

The Corps sumarized responses to the public notice and their general environmental assessment of the case. A few of their points are noteworthy:

1) No guidelines are available to determine what quantities of migratory waterfowl are required in order to provide a sufficient nexus to interstate commerce. Madrona Marsh is along a major migratory route and some of the birds that winter or nest there eventually migrate to areas where hunting is allowed. Madrona Marsh supports approximately 10% of the seasonally wet freshwater marsh in the coastal Los Angeles/Orange County Region, including some other wetlands previously taken under discretionary jurisdiction. The loss of any 10% of these wetlands may not significantly impact migratory waterfowl, but the cumulative loss of all or possibly 50% or possibly 25% of these wetlands is likely to be significant. Even the loss of 10% of the habitat is expected to decrease the carrying capacity to some extent. In Southern California the wetlands are already at carrying capacity and no alternative habitat is available in the vicinity. If the migratory waterfowl do find alternative habitat it may be another state (i.e., along the Colorado River in Arizona) or another county (Mexico). This displacement of waterfowl from the state could increase waterfowl hunting in Arizona or Mexico while decreasing hunting in California.

2) Interstate and International Visitors. Wetlands which are or could be used by interstate or foreign travelers for recreational or other purposes are waters of the United States according to 404(b) (1) guidelines. Thirty-four specific interstate and international visitors were cited. It is clear that use of Madrona Marsh by interstate and foreign travelers provides a nexus to interstate and foreign commerce. Whether or not this is "sufficient" is a matter of interpretation.

3) Oil Extraction. Although oil has been extracted from the 54-acre site since the 1920's and this oil has been an undisputed item of interstate commerce, it is not evident that this activity is wetland dependent. Therefore, oil extraction shall not be considered a nexus to interstate commerce.

4) Natural Lake. Madrona Marsh could be considered a natural lake over 10 acres (if adjacent wetlands are included). If so, and if its destruction or degradation could affect interstate or foreign commerce than an individual Section 404 permit would be required. The regulations and guidelines do not give a good definition of a lake, and they do not specify if permanent water is required.

The Corps has officially droped their jurisdiction over this area.

/129/

The Torrence City Council had formerly supported the project and approved the use permit on its first reading. Madrona Marsh was a campaign issue during the Torrence City Council elections in June 1982. The Friends of Madrona Marsh were very active in the elections and three of the four candidates they endorsed were elected. The marsh was then the subject of a petition drive to place a referendum on the ballot to rescind the Council's approval of the use permit for the development. The referendum easily qualified and as a result the Council overturned their decision and ruled against the development in subsequent hearings. /198b, 155/

The difficulty in determining jurisdiction through interpretation of the regulations and their lack of clear definitions is exemplified in this case history. Citizen action reflected through the local community was responsible for regulatory authority being invoked over the marsh.

EXCESSES IN REGULATION

The measurement of effectiveness of the Corps regulatory programs depends on the experience and role of the informant. A landowner or developer seeking entitlements is likely to view the permit process as excessive, or at least mystifying. One consultant involved in the regulatory process had these points to make:

> The time required to move through the Corps; Section 10 or 404 permit procedures depends on the size and type of the project, the number of agencies involved, whether an environmental impact statement is required, and the environmental opposition. These requirements are not unique to the Los Angeles District. Preparing an application for a Corps' certification, in turn, requires applications and back up information. Thus, the permit application may require a number of months to complete.
>
> Because overall time involved may easily amount to six months or more, a careful sequencing of steps is necessary. Even with these efforts, there may be significant delays in the project schedule, with attendant increase in costs.

Agencies and/or citizen groups opposing a given project can cause costly delays, possible project modification, or even cancellation. When issues cannot be resolved, opposing sides invoke political pressures, and in some cases, resort to litigation.

A case in point is the *San Diego Harbor Navigation Improvement.*

> "As originally proposed, the project involved dredging about 12 million cubic yards of material and, when authorized by Congress, was estimated to cost about $8 to $10 million, with work to commence in 1972. A series of institutional constraints (primarily of an environmental nature) effected substantial changes in the project design and a three year delay in schedule.
>
> "This project embodies a near-classic example of how institutional constraints operate. In the course of developing project design and the EIR for this project, the Corps interacted with a large number of federal, state, and local agencies and public interest groups. More specifically, from July 1970 to December 1974, the Corps had more than 48 meetings with other agencies to ensure that the concerns of each were considered in the final design. In addition, some 26 letters of comment on the General Design Memorandum were received from agencies and firms between January 1972 and January 1975; it is noteworthy that all but four of these addressed disposal of dredging material.
>
> "When finally approved in 1975, the project had been reduced to 8.5 million cubic yards and the estimated cost had escalated to about $16.3 million. When the contract was awarded in August 1975, the actual price was $18.7 million. /199b/

It is important to note that this project was evaluated at a time when the 404 program was new and may not have operated so smoothly.

THE ROLE OF OTHER REGULATORY AGENCIES

Prior to issuance of any Corps permit an applicant must obtain a Coastal Commission permit or, if it is a federal project, a determination of consistency with the Coastal Zone Management Program must be completed. The overlap between the Corps and the Coastal Commission occurs only within the coastal zone. The Corps jurisdiction extends beyond this Zone into historic wetlands and riparian areas. The Commission, however,

may regulate certain activities not covered by the Corps (e.g., vegetation removal). The Coastal Zone boundary is based upon less specific criteria than is the Corps' jurisdiction. It is also subject to political manipulation; the Califronia legislature has changed the boundary in certain land areas several times. /187/

A summary of Commission actions in coastal wetlands (Table 18) reveals that few fills have been allowed. Over the entire California coast, the Commission claims to have preserved 6,095 acres of wetlands through their permit actions. /10/ Development proposals for several coastal wetlands (i.e., Bolsa Chica, Ballona Marsh) are under contention and litigation by the applicants and the Commission. The primary issue in both cases is the definition of wetland. /189/ The Corps has not yet become involved in either proposal.

The L.A. District is currently negotiating a general permit with the Coastal Commission for activities that are consistent with the local coastal plans that are being completed by local cities and counties. The Commission staff and the Corps are discussing conditions and categories of activities, but no decisions have been made. The Commission is presently understaffed and may not be able to accomodate this additional workload. / 175a/

The Coastal Conservancy is an important participant in wetlands preservation along the South Coast through their restoration and grant programs. Although not a regulatory agency, the Conservancy is effective in preserving wetland area through grants for restoration. The Conservancy negotiates with developers to consolidate wetland areas and develop lands into workable restoration/development plans. The numerous ownerships in wetlands can forestall any regulatory action as a whole. /211/ The consolidation scheme used by the Conservancy has worked particularly well at Los Cerritos wetlands. /170/

TABLE 19

COASTAL COMMISSION WETLAND PRESERVATION RECORD

| Region | Year | Wetland Name | Acreage Preserved or Saved | Type of Action |
|---|---|---|---|---|
| SAN DIEGO COAST | 1976 | San Elijo Lagoon | 100 | County to do restoration |
| | | Batiquitos Lagoon | | Water district permitted to open lagoon mouth |
| | 1979 | Canyon de las Salinas Creek | 1.5 | State Commission denied fill |
| | | San Dieguito | 1 | Restoration as condition for subdivision of adjacent upland |
| | 1979 | Los Penasquitos | .16 | State Commission denied permit that would fill wetland |
| | 1978 | San Diego Bay | 84 | Port District is constricting a wildlife reserve |
| | 1979 | Sweetwater Marsh | 8 | Conditioned LCP land use |
| | 1979 | Sweetwater Marsh | 180 | Plan to delete extention of two roads. Certified LCP and required buffers, removed incompatible uses. |
| SOUTH COAST | | Balboa Lagoon | 5.5 | |
| SOUTH CENTRAL COAST | 1980 | Santa Monica River | 100 | Regional Commission required dedication of wetland |
| | 1980 | Ventura River | 6 | State Commission required State Parks and Recreation to leave wetland undeveloped |
| | 1978 | Pismo Lake Ecological Reserve | 4.5 | Regional Commission required dedication of wetland—Grover City accepted offer |
| | 1979 | Pismo Lake Ecological Reserve | 15.25 | Regional Commission required dedication of wetland—Fish and Game accepted |
| | 1979 | Baywood/Los Osos Marsh | 10 | Regional Commission put deed restriction on permit |

SOURCE: William Travis. 1980. Evaluation of California's Coastal Zone Management Program. Letter to Rosella Sossman, Office of Coastal Zone Management.

Watershed erosion due to development and resultant sedimentation of downstream wetlands is rarely regulated on the south coast. Although the Regional Quality Control Board may issue clean-up orders for sediments, they must first clearly identify the source, a difficult task in a rapidly developing watershed of any size. Southern California Association of Governments (SCAG) has recently drafted a set of actions and policies for local governments in the Upper Newport Bay watershed. This action was completed under SCAG's 208 planning process after identification of the problem of sedimentation in Upper Newport Bay. A stream zone protection ordinance was also drafted to give guidance to local jurisdictions. However, the adoption and enforcement of these ordinances by local governments is voluntary. /169/ Several communities have instituted erosion control ordinances in response to their recognition of liability in cases of storm damage resulting from permitted developments (e.g., City of Carlsbad).

Riparian areas in the desert resion are regulated under nationwide permit only. The Bureau of Land Management controls much of this area and in their recent planning efforts have identified many riparian areas as Areas of Critical Environmental Concern (ACEC). This designation affords these resources special management plans and activity plans which identify future compatible and incompatible uses.

BLM is also responsible for regulating mining on their public lands. The new regulation, Surface Management of Public Mining (43 CFR subpart 3809), requires each mine operator to submit a plan of operation which BLM staff review and comment on. Significant impacts on riparian areas can sometimes be avoided by modification of this plan. Mitigation for losses are not required and public review is not included in this process. Under BLM regulations mining operations which do impact riparian resources can only be informed of their effects, not stopped. /163/

In July 1982, the Los Angeles District completed a general permit authorizing certain activities on single lots along particular stretches of the Colorado River. This permit required the initial cooperation of the wildlife agencies, Corps, and the Bureau of Reclamation, but is an attempt to minimize review for routine individual activities. The general permit will allow installation and maintenance of contiguous bulkhead walls, riprap slopes, importation of sand for beaches, individual boat docks, and community boat docks. Stipulations placed on the permit clearly define "allowed" and "restricted" activities. The Corps provides index maps which indicate areas of the river where the general permit applies. Both the Corps and the reviewing agencies are satisfied with this resolution. /174,212,190 /

The regulation of water flows in the river are the responsibility of the Bureau of Reclamation and are managed in response to power and irrigation needs of the water users. In addition, many of the remaining wetland and riparian areas are now protected in National Wildlife Refuges.

# SUMMARY
# OF POLICY OPTIONS

While interviewing personnel in the various regulatory agencies we discussed several possible options and changes to the current 404 program. These included increased enforcement of the present Corps program; the delegation of the federal 404 program to the state; increased use of general permits; rescission of exemptions covering certain activities (agriculture and silviculture); and other suggested modifications. Answers among participants were general and often in agreement on certain points. Our discussion does not represent a complete investigation of possible changes to the Corps program but rather an overview of several ideas.

## INCREASED ENFORCEMENT

Most participants considered increased enforcement as a major improvement to the present program. Suggested practices included increase of enforcement staff and surveillance, and institution of mandatory fines for after the fact permits. Several agency personnel suggested giving the Corps fining power in the case of illegal actions and permit violations as well as the development of a greater understanding with the U.S. Attorney General's office for prosecution of violators. Overall, while the Corps Districts may handle their responsibilities effectively, many participants pointed out the need for an effective enforcement program.

## DELEGATION OF 404 PROGRAM TO THE STATE

Reactions to this option were mixed. Many participants did not feel any one state agency could assume the federal role in regards to wetlands regulation. The more immediate political influence could sway state policy more readily than federal, resulting in a diluted regulatory program. The application of Section 10 in conjunction with 404 would create a problem with state takeover of only the 404 program. State agencies suggested, as recipients of the program included Department of Fish and Game, Regional Water Quality Control Boards, State Lands Commission, or the creation of a new wetland regulatory agency. Several federal personnel felt that if the responsibilities of the program were delegated to several different agencies, disagreement would ensue and forestall effective regulation. Others thought state takeover was a good idea. Personnel of

the Department of Fish and Game stated they could take over the program if provided with added personnel and adequate jurisdiction. Many participants pointed out the need for the federal government to retain veto power over any state program. The EPA was identified as a logical choice for federal transfer of the Corps program.

INCREASED USE OF GENERAL PERMITS

This option was viewed by some as an easy method by which paperwork and time consumed by small and routine activities could be reduced. Certain types of projects in certain geographic areas are being considered for general permits. Currently those activities occurring in overlapping jurisdictions of the Corps and state agencies (BCDC, Coastal Commission) were particularly suited for delegation to general permits issued to the state agency. Several people voiced concern over the level of enforcement and number of stipulations which could be placed on general permits to lessen or avoid environmental impacts. Many types of activities were unsuitable for this permit level; these are often the more controversial and time consuming permit applications.

EXEMPTED ACTIVITIES

Exempted activities include silvicultural and agricultural operations which fill or affect wetlands in the course of their routine. These operations affect wetlands mostly in the North Coast, Klamath Basin and Central Valley. In order to regulate these activities, Corps staff would have to be increased substantially. Silviculture is already regulated by the State Boad of Forestry. Agricultural practices are largely unregulated. No one interviewed favored regulating these operations under the 404 program.

OTHER OPTIONS OR CHANGES

Corps and other agency personnel suggested several improvements to the present program. These included: a clear definition of wetlands used by all agencies; revision of federal agency review of permit applications

to one combined environmental agency; use of regional wetland plans in concert with permit review; expansion of individual permit authority over some areas now covered by nationwide permit (e.g., above headwaters, isolated wetlands); increased application charges to discourage "wild cat" projects in obvious non-conformance to program policies; and the passage of a national wetlands preservation act to solidify congressional intent under the Clean Water Act. Overall most participants felt federal involvement in wetland regulation was essential to continuance of the resource and should not be abandoned.

RECENT REVISIONS

The recent procedural changes in 404 regulation were felt by many to hamper the application process due to time limitations. Under the new time constraints, if a project could not be given substantial review, many participants stated they would deny more permits rather than streamlining permit granting.

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Sacramento Workshop June 10, 1982

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